HOSPITAL AND MEDICAL FACILITIES SERIES

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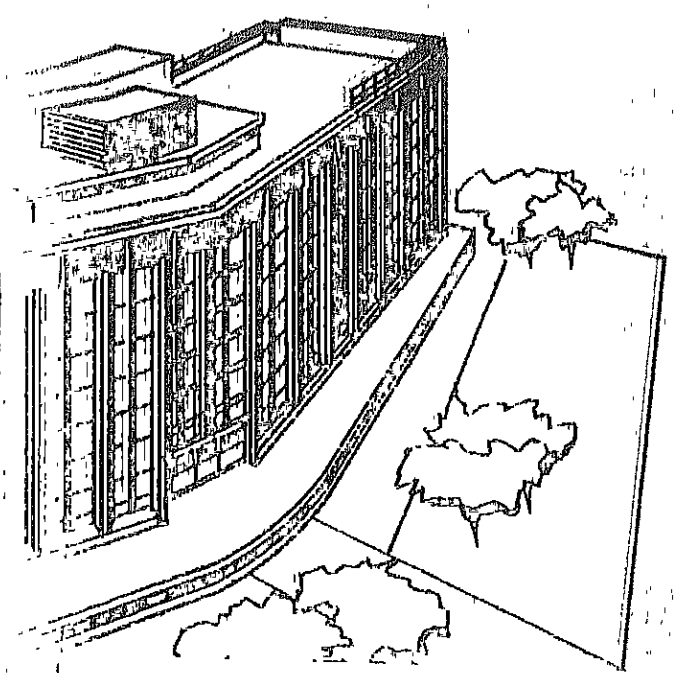

ENVIRONMENTAL ASPECTS of the HOSPITAL

volume II
SUPPORTIVE DEPARTMENTS

This report presents a collection of papers on the past and present concepts of the hospital environment and the principles for establishing and carrying out control programs. It is Volume II of a series of publications with the overall title, "Environmental Aspects of the Hospital," developed as a joint project of the Division of Hospital and Medical Facilities and the Division of Environmental Engineering and Food Protection of the Public Health Service. The papers in the series were prepared by authorities who have extensive experience in their specialties, with particular reference to medical facilities.

ENVIRONMENTAL ASPECTS of the HOSPITAL

volume II SUPPORTIVE DEPARTMENT

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service

Division of Hospital and Medical Facilities and
Division of Environmental Engineering and Food Protection
Washington, D.C. 20201

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foreword

THIS publication is Volume II in a series intended as a guide for developing environmental control programs in the modern hospital. The responsibilities of each department head in carrying out these programs are given special attention.

The papers in this volume, although prepared by recognized authorities, do not attempt to offer exact solutions or to set forth criteria to be uniformly followed in every hospital. Instead, they are intended to provide the broad framework upon which specific solutions determined by local circumstances and resources can be based.

The Committee on Environmental Engineering Aspects of Hospitals and Medical Care Institutions, listed on the following page, served as the review and advisory group on the content of the series.

Volume II deals with the supportive departments and the principles of environmental programs in those areas where daily procedures most significantly affect and support medical and paramedical care of the patient. The departments and services discussed are responsible for the removal or control of the majority of contaminating substances found in the hospital. The Central Medical and Surgical Supply Service is not included because it has been covered in a series of guides recently published by this Division.

Other publications deal with infection control, safety programs, and administrative aspects of environmental control.

Major credit for these publications is due Robert L. Schaeffer, Environmental Research Consultant, who served as project director and coordinated the work of the two Divisions.

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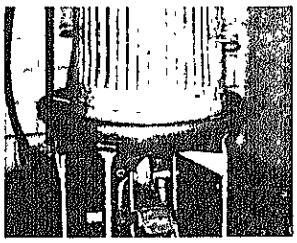
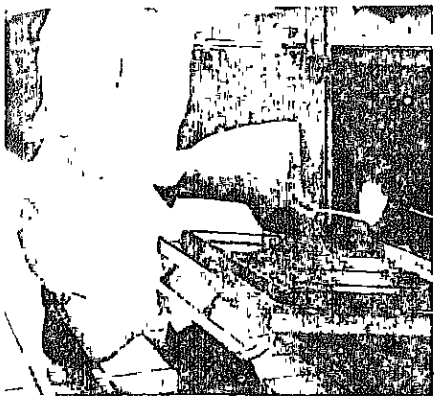
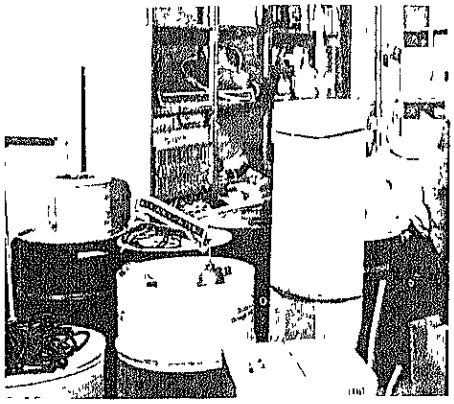

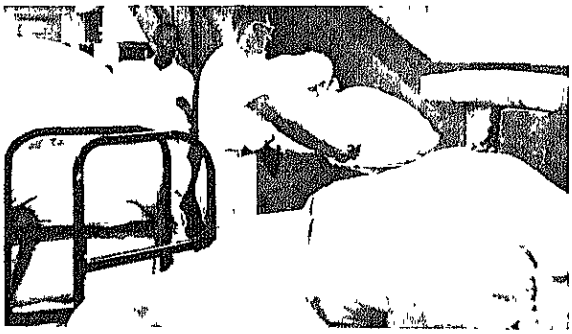

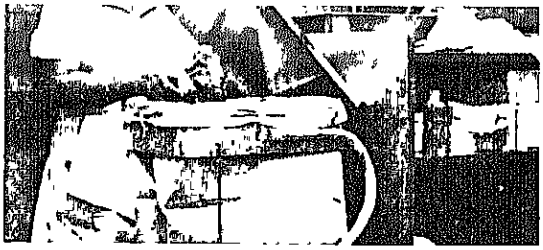

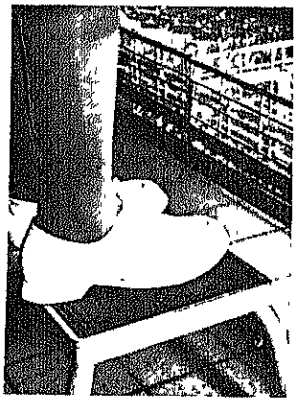

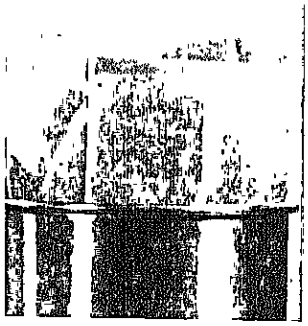

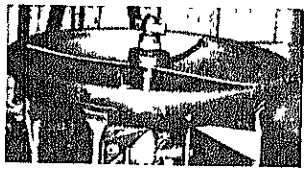
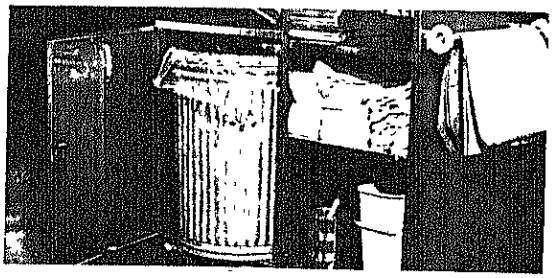

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HOUSEKEEPING SERVICES

Charles L. Vincent

HOUSEKEEPING SERVICES maintain clean, safe, and orderly surroundings for patients and personnel. This entails keeping internal premises, equipment, and facilities clean and in order at all times. Because these services reach every department, coordination of plans with all departments is essential to an efficiently operating housekeeping program.

An effective program depends upon a sound work plan and proper use of personnel and equipment to carry it out. This chapter focuses on work scheduling techniques and some of the principles of effective personnel utilization. Procedures are not included since numerous detailed procedure guides*, as well as an enormous variety of cleaning supplies and equipment, are available to the executive housekeeper, whose choices will be based on personal experience.

Organization of housekeeping services will vary with each institution. Although no answer fits every situation, the following material can be adjusted to individual needs.

WORK PLANNING

Preparation of a graphic outline of what needs to be done is the first step in work planning. One method is for the executive housekeeper to use blueprints of the entire plant. He may wish to have one set for his own use and another to post outside his office for housekeeping supervisors' reference. The blueprint helps to identify, classify, and estimate workload.

Coding the Blueprint

Type of Floor. The first step is to color code each space or room as to type of floor.

Example: Brown — wooden
Blue — carpeted
Red — hard (ceramic, terrazzo)

Space Use. The next step is to prefix a space-use code to the location number. Example:

O — office
P — patient room
PB — patient bathroom
H — hall
L — lobby or waiting room
S — surgical
M — medical
N — nursery
E — employee locker, dressing room
EB — employee bathroom, shower, lavatory

A three- or four-digit code can be used for specific location—the first two digits for floor number, the second two for room or space number.

Example: 0-0101 would be first floor, office No. 1
P-1022 would be tenth floor, patient bedroom No. 22

Space Congestion. Next a subscript number is added after the space-use code to identify the relative congestion of the space. No subscript indicates no furniture, such as in a corridor or lobby. Usual designations are:

1 = *Lightly congested.* Furniture or equipment occupies about one-fifth of area.
2 = *Moderately congested.* Furniture or equipment occupies about one-third of area.

Mr. Vincent is executive housekeeper for St. Mary's Hospital, Grand Rapids, Mich.

* See Additional Reading list.

3 = *Heavily congested* Furniture or equipment occupies one-half or more of area

The correct designation is determined as follows: Example: *Space* 0–0101 is 10′ x 15′, or 150 sq. ft.

Contents:

Two desks	— 12 sq. ft.
Two typing chairs	— 3 sq. ft.
Two straight chairs	— 4 sq. ft.
3 files	— 10 sq. ft.
Floor storage (3 boxes of files) each 1½ sq. ft. x 3 (triple rating)	— 13 sq. ft.
One counter, open at bottom, 1½ ft. x 6 ft.	— 9 sq. ft.
Total	— 53 sq. ft., or approximately ⅓ of the area (moderately congested).

The size of the space in square feet is then entered in parentheses. The complete description of Example Office 0–0101 is now 0_2–0101(150), entered in ink on the blueprint, except for the subscript number which may change and is, therefore, entered in pencil. An additional refinement, where necessary, is a suffix "P" [0_2–0101(150)P] to indicate a porous floor, whether unsealed concrete or terrazzo, or an old or abused resilient floor. This is significant information since either additional or different cleaning methods may be required. Even when sealers are applied, such floors require extra labor.

In order to measure and fairly allocate the workload in room 0_2–0101(150)P, as in the entire hospital, the cleaning problems must be analyzed in terms of the planning diagram, the amount and kind of soil estimated, the necessary operations selected, and reasonable unit times determined per square foot.

Work Units

The unit of work represents an average time per square foot required to perform a routine cleaning function for each type and classification of space. The figure is usually multiplied by 100 to avoid small decimal values. The range of performance times is valuable for reference since the administrator will be interested in workload variations and the reasons for them.

Cleaning operations are selected to give overall efficiency in the total program. When comparing the efficiency of individual procedures, it is sometimes necessary to select a more expensive alternative if it eliminates or conserves other work operations When other factors are equal, however, the fastest method is the best. There are published tables giving approximations of "standard" times for each operation, but these vary as much as 200 percent, and have little general value. Example:

Method	*Minutes Per 100 Sq. Ft.*
Damp or treated sweep—offices	2.0
Damp or treated sweep—unobstructed corridors	0.7
Vacuum—offices	1.2
Vacuum—unobstructed corridors	1.0

Other complications arise because of varying types and amounts of soil deposited in any room, area, or building. Some differences are predictable, such as seasonal variation in air pollution, amount of tracked-in soil, and more routine factors such as amount of soilage from room occupants. Chance variations occur daily that cannot be predicted or planned for. The routine program is planned only for soil conditions that can be observed and classified.

Computing Performance Time Averages

To find the performance time average for any tasks, a sample group of workers is observed and the number of minutes required to complete a task is listed. These results are arranged in order from the longest to the shortest time. The arithmetic average is computed by totaling the minutes and dividing by the number of entries. The entries appearing on the list above the average are the high portion. These are in turn totaled and divided by the number of entries to obtain the high average. Similar computation of the entries below the average provides the low average. (See Table I.) Next, one-fourth (or nearest approximation) of the scores are subtracted from both the high and low end of the performance scores to reduce the critical variation caused by very good and very poor workers. Then, 10 percent of the best remaining scores (least number of minutes) are likewise discarded. This step adds a further reliability factor. From the remaining data the adjusted averages are

computed, thus providing performance times for work planning.

When the curve is applied (see table I), the spread and proportion become more realistic. Experience confirms that in any group of workers there is seldom a 220 percent difference between low average performance and high average performance, as was reflected in the initial actual performance time averages.

The adjusted averages indicate poor performance to be about 14 minutes, (high adjusted average), and good performance to be about 11 minutes (low adjusted average), with a 20 percent difference between individuals within the two groups.

The application of these hypotheses is based on empirical data and experience in general hospitals. Although this approach has been found to constitute a good general method, it must be tested by an executive housekeeper in light of his own needs in his own hospital.

Classifying and Computing the Workload

Housekeeping operations can be separated into two categories: (1) Nonskilled and light work; (2) Semiskilled and heavy work. Procedures in these categories are selected for daily, weekly, monthly, and other periodic cleaning for each room, space, floor, or area.

Average performance times for each complete procedure in each type of room or space are calculated as shown in table II and expressed in minutes per 100 square feet to avoid small decimal figures. To compute the total performance time values for lightly, moderately, and heavily congested areas, the average performance time values are multiplied by the square footage of each congestion category on a given floor and the total derived work time for that floor.

With the total amount of workload developed for each category and each procedure, the blueprint becomes a reasonably accurate reference for staffing. It presents information to the administrator, executive housekeeper, and employees in an understandable manner.

WORK SCHEDULING

The total amount of labor developed can now be allocated and scheduled for individuals. Routine daily and weekly work is best scheduled on forms

Table I. **Application of Normal Curve Estimation Method to Actual Performance Times**

Daily Dusting Procedure, Office, Congestion Category 2

	Actual Individual Worker's Performance Times (Minutes)	ADJUSTMENT			
			Remaining Scores	ADJUSTMENT	Final Adjusted Average Performance Times (Minutes)
	21)*				
HIGH AVERAGE	19)*				
(15.5)	18)*				
	15		15		15
	14		14		14 HIGH Adj. Av. (14)
	13		13		13
	12		12		12 ADJ. Av. (12.1)
AVERAGE	11		12		12
(11.8)	10		10		10 LOW Adj. Av. (10.8)
	9		9		0
LOW AVERAGE	7		7†		
(7.0)	6)*				
	6)*				
	4)*				
Total	166				

* Indicates upper and lower ⅓ (approximately) of the total scores to be discarded in first adjustment

† Indicates 1/10 (approximately) of low scores to be discarded in second adjustment

Table II. Calculation of Total Performance Time by Category

Daily dusting in offices, first floor

Congestion Category	Average Performance Time (min./100 sq. ft.)	Sq. Ft. (00's)	Total Performance Time by Category (in minutes)
O_1	12.1	42.9	519
O_2	15.0	36.0	540
O_3	18.5	20.0	370
		Total Time:	1429 minutes (23 hours, 49 minutes) worktime

that permit needed flexibility. (See appendix A.)

Coordination should be developed between maids and the housemen who do weekly and checkout floor work, so that this cleaning can be done simultaneously whenever possible. Coordinating daily, weekly, and periodic cleaning is extremely important. No matter how efficiently done, if cleaning unnecessarily interrupts other necessary routines, unfavorable patient and staff reactions result. In general areas, task scheduling is possible if the area can be entirely completed and in order before occupancy the next morning. The danger here is the dislocation that occurs when housekeeping personnel are absent and the supervisor must reassign routine work. With routine cleaning based on the unit system, it is simpler to give instructions for intelligent "skipping" or deletion of weekly work to extend the coverage of each worker on duty. In extreme situations, project workers can be assigned to assist routine workers.

In scheduling total hours, some allowance should be made for variables such as absenteeism, emesis, and spillage. The usual method of meeting such conditions, as well as those caused by snowstorms and natural disasters, is simply not to do some of the routine items that day. Where possible, some record of the approximate time required for such extra work should be kept as a guide for emergency planning.

In some hospitals, littering is so prevalent that extra procedures are needed to cope with it; in other hospitals it is slight. Any degree of littering should be avoided. Every executive housekeeper understands the negative aspects of a crushed cigarette butt in the middle of a lobby floor. A used tissue offends even more. Gross littering is an administrative problem, and in self defense the executive housekeeper should assign someone to check all main public areas at least once every two hours. The alert housekeeper will determine whether littering shows the need for more ash trays and waste receptacles, or whether those in use should be more conveniently located.

Conservation of employees' travel time is a cardinal principle of housekeeping. Scheduled procedures should be studied to determine what jobs can be combined on the same route without loss of efficiency. The litter check can be made by various workers who pass public areas, such as the trash disposal man, the sand urn servicer, or the washroom cleaner.

Observation of Total Plant

A vital item in accomplishing routine work is the worker's own habit of observation. Observation not only includes a maid's check of her own work performance but a check of everything with which she comes in contact that relates to housekeeping work, such as unsatisfactory condition of furniture, wastebaskets, blinds, floor tiles or baseboards, leaking windows, littering or soiling by area occupants. Employees should be trained to report such observations on an appropriate form. (See figure 1.) The executive housekeeper cannot possibly inspect every item in the hospital every day, so he must make every pair of eyes an extension of his own, and train them to be as alert as possible to the total environment.

Individual Assignments

The last step in scheduling the workload is to make out a personnel schedule showing each individual's area assignment, operations to be per-

formed, hours of work, and days on and off duty. General area work is usually scheduled for evening or night hours to avoid disruption of the patient care routine. Each work assignment should have a job number, such as Maid No. 1, No. 2; Floor Team No. 1, No. 2; with suffix numbers to show day and evening or night shifts.

Figure 1. **Sample Form of Report of Unsatisfactory Condition.**

Building_____ Floor_____ Room_____ Date_____

Item _____

Reason _____

If equipment fault: Needs replacement ☐
Needs repair ☐
Needs additional item ☐

Measuring Cleanliness

Some attempt should be made to evaluate housekeeping services As yet, objective methods of measurement are not available. For example, how does one measure the degree of cleanliness? Fortunately, methods do exist to evaluate the biological flora in the hospital to aid in reducing the spread of infection. In this regard, bacteriological studies give an objective measure. However, many areas in the hospital such as corridors, lobbies, stairways, and elevators are cleaned principally for the sake of appearance, because a hospital must always look as nearly immaculate as it should be in reality. How long such areas remain clean and how much their contamination level depends on housekeeping techniques has been indicated by recent studies.[1] Unfortunately, no proven method now exists for practical measurement of surface soil levels (not bacteriological levels) on which to base cleaning schedules to maintain esthetic requirements in noncritical areas without over-cleaning and its accompanying waste of resources. Some efforts have been made to develop such needed techniques.[2] In the future it may be possible to administer housekeeping services without compromising cleaning requirements or wasting the hospital's limited resources. Until such measures are available, evaluation of housekeeping services will be largely subjective, based on educated judgments as to whether the standards each hospital has set for itself have been achieved.

HOUSEKEEPING PERSONNEL

Most personnel management functions are usually performed by the personnel department in collaboration with all the various services and departments. In this regard, hospitals show wide patterns of variation. Some have a centralized department responsible for all aspects of personnel management, including training. Others have decentralized personnel services, with each department responsible for its own services and training. In some hospitals, the housekeeping department may have all the responsibilities for its personnel, ranging from recruitment to training. No attempt is made here to cover the field of personnel management but rather to present some highlights which have a particular bearing on housekeeping.

It should be recognized that hospitals often have lagged behind business and industry in applying scientific findings to personnel management. Aptitude and ability tests enjoy wide use in industry and are almost a routine part of the selection process. Similarly, industries have developed weighted application blanks, performance criteria for promotion, tests for the assessment of potential, and performance standards. Although experienced industrial psychologists acknowledge the limitations of these tools, they point to test values when correctly used.

Hospitals are showing an increasing interest in industry's accomplishments. In the near future, such interest will inevitably produce developments which should help to strengthen the processes of employee selection and evaluation. In the meantime, guidelines will continue to be derived from the pooled experience and best judgment of practitioners in the hospital field.

Employee Selection

The cycle of selecting, placing, and training housekeeping personnel begins at the employment interview. Interviewing can screen out the obviously unfit if the interview is based upon definite requirements and a valid job description.

The purposes of the employment interview are: (1) To afford an opportunity for the interviewer to estimate the applicant's essential qualifications; (2) To give the applicant essential facts, both favorable and unfavorable, about the job and the hospital.

Experiences of hospitals seem to indicate the following essential qualifications for housekeeping personnel:

Character. (1) Satisfactory work record indicating reliability and sobriety, (2) Willingness and openness shown by applicant in discussing routine information about work history, marital status, and family relationships.

Education. Communication, both written and oral, is important because of the dispersed housekeeping situation. The applicant should demonstrate the ability to read and understand housekeeping instructions and to talk about them.

Physical Makeup. (1) Should be fairly strong and agile; not so overweight as to hinder stooping, climbing, and working in congested spaces. (2) Should have fairly good vision, or correction with glasses. Should not be color blind in any marked degree.

Intelligence. Applicant should rate no lower than dull normal because of the dispersed working situation and the necessity to make some decisions and handle minor situations.

Experience. Experience in housekeeping work is not essential. Previous experience cannot be relied upon as a substitute for training and may even interfere with the hospital's own training objectives for new employees. In particular, maids with long experience in private home cleaning may be difficult to train for institutions because of the different procedures and extensive coverage required.

Age. Maturity is a prime asset of a good housekeeping employee because of the lack of close supervision, especially in patient areas where the employee represents the image of the housekeeping department and the hospital. Experience suggests that as a general rule women should be over 20 and men over 24.

Sex. Female labor is usually selected for routine nonskilled and light work because work demands are compatible with a woman's natural limitations of strength and balance. There also may be local laws or union regulations prohibiting women from climbing ladders, using mops heavier than a given weight, lifting buckets, and the like. Generally speaking, wages for female employees are lower because of these limitations.

St. Vincent's Hospital, New York City, conducted a study [3] to determine the characteristics of successful maids and porters, i.e., those who were rated "good" or better for at least two years, as compared with an unsuccessful group, i.e., those who were rated less than good and who left or were discharged soon after hiring.

Findings indicated that the following significant factors should be considered in hiring maids and porters:

- A strong desire to work in a hospital because the applicant feels that at least indirectly he is helping the sick
- Some previous experience as maid or porter (but not necessarily hospital experience) which reduces the danger of hiring "floaters"
- Applicants between 30 and 40 years of age with home responsibilities
- Recent earnings comparable to those paid in the position to be filled

Probationary Period

The probationary period for housekeeping employees is usually 3 months. During this time every new employee should come under careful scrutiny, be evaluated on actual performance, and have an estimate made of his or her potential. Evaluation criteria should be based on the best present performance of the housekeeping staff, grouped by male and female, with appropriate allowance made for the new employee's lack of experience. Where a new employee is still regarded as "borderline" at the end of probation, a careful estimate should be made of his potential capacity for improvement.

Emplayee Training

To some degree, housekeeping training needs are unique for each hospital. Specific needs must be analyzed in accordance with basic principles. There is a continuing need to coordinate observation with verbal concepts and both of these with physical activities. The following fundamentals will serve for general guidance of the trainer-supervisor:

1. Training is the most responsible function of the supervisor. The individual's supervisor is also the best person to train him. Training in the mechanics of the necessary procedures may be delegated to a qualified houseman, but judging proficiency in the application of these procedures must be done by the supervisor.

2. Orientation to departmental functions and goals and an outline of the training program should precede any actual training.

3. On-the-job training is a necessity because classroom situations, although valuable as one part of the program, cannot duplicate actual cleaning conditions.

4. Training must not be superfluous by repeating material already mastered. Each individual should be kept informed of his progress by periodic review of work rating forms, and training emphasis put on those points which can be improved.

5. Visual aids should be used whenever possible and be closely related to simple, understandable explanations of the significance of the procedures portrayed.

Training of maids or housekeeping aides does not usually require as much time as training housemen. Dusting, damp mopping, and other daily cleaning procedures usually can be taught in one day. Bed making, checkout, and weekly cleaning procedures require from 1 to 2 days more. Full proficiency can usually be attained in 2 weeks.

Training in any procedure should not go beyond the point at which the trainee can satisfactorily demonstrate each step in the proper sequence. At this time the trainee is put to work assisting the regular maids or housemen in that procedure as opportunity permits, so that even during basic training an individual can obtain skill and confidence. The housekeeper should be present before the procedure is begun to explain the present condition of the area to be cleaned in such terms as fair or good, as outlined in Work Rating Form explanations. (See appendix A.) He should then define the probable results of a specific procedure in the same terms. The housekeeper should return once or twice to observe progress and make mental notes but offer no comments until completion. At this point the trainee is asked to inspect results himself, first without a Work Rating Form, and then with one. The housekeeper then rates the results himself and gives corrective instructions. When a trainee demonstrates that he can evaluate and communicate a procedural result, he must then perform the operation himself to be considered proficient.

This method of training not only coordinates all aspects of the work but also allows an early and accurate judgment of the trainee's acceptability. In the case of maids this criterion is obtained from judging the weekly cleaning procedures, since daily dusting and cleaning are generally rated as either satisfactory or unsatisfactory.

All housekeeping personnel must understand the basic facts about the porosity of surfaces they clean, the cleaning difficulties caused by porosity, and the nature and types of soiling. Under ordinary circumstances, polishes, finishes, and waxes resist soil penetration, protect permanent finishes, and improve appearance. If properly maintained, protective coatings deteriorate chiefly from slow oxidation. The most prominent evidence of deterioration is a gradual darkening caused by oxidation changes in the material and the degree of soil absorption. If uniform, darkening sometimes improves the patina. Because darkening is usually so gradual, it is not noticeable in itself until it obscures reflection of light and color from the floor. At this point it becomes just another obscuring film and must be removed like any other soil. That is to say, the quality rating of floor care may fluctuate from a "just cleaned" quality (good) down to a fair condition at the end of shift. This is dependent on such factors as foot traffic, weather conditions, and necessary cleaning delays so as not to interrupt patient care routines. Over a 7-day period the quality of floor care will usually show fairly uniform decline. Both daily and weekly results, however, are subject to the gradually declining quality imposed by the general surface-finish deterioration, which is corrected by the monthly machine scrub and by waxing and buffing in heaviest traffic areas.

Neither the daily nor weekly routine is intended to restore the finish to the level achieved by the monthly routine.

Maids or housemen working on the same floor every day can be unaware of the extent of deterioration because of its gradual onset unless they are trained to make specific weekly inspections for soil buildup. Housekeeping supervisors cannot observe everything in their assigned area, and if working personnel are not trained to inspect their own work, staff members or visitors are bound to notice.

This probability does not apply to spaces that "belong" to housekeeping personnel, such as janitor supply closets. These are not routinely seen by people outside the housekeeping staff, which may be the reason why they are often in a dirty and cluttered condition. (See figure 2.) One experienced hospital sanitarian has commented that he can accurately estimate the quality of a housekeeping program by observing the condition of janitor closets and storerooms and the appearance and state of repair of cleaning equipment. Training should emphasize the importance of proper clean-

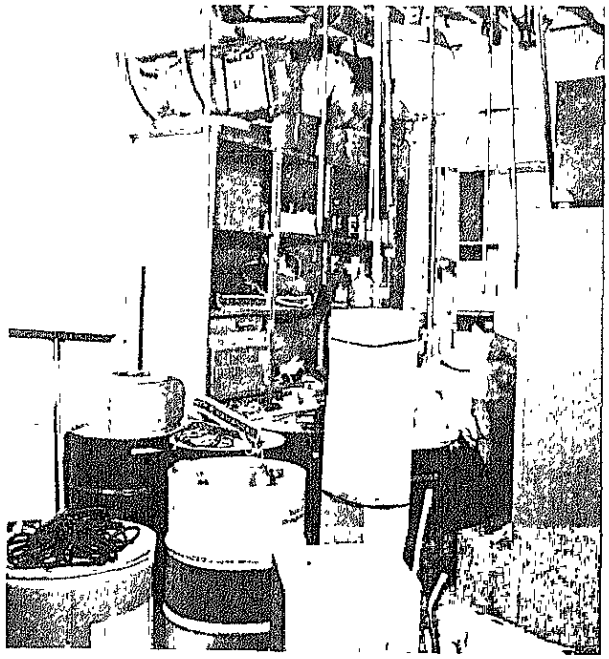

Figure 2. **Poor storage of cleaning items means lost worktime and possible accidents.**

ing and maintenance of closets, storerooms, and the supplies and equipment they contain.

New employees should be trained until their supervisor has indicated their competence in performing every procedure listed in their job descriptions. Nothing ruins the potential of a new employee more quickly than to be put to work only partially trained and then forgotten. This is especially true for a houseman called upon, after training deficiencies are forgotten, to perform a floor procedure he was never taught. If housemen are assigned to area cleaning, the supervisor should follow a rotating training schedule within an allotted time, preferably no longer than two weeks for all basic procedures. When any basic procedures are not scheduled in the supervisor's section *during this* time, the new employee should be temporarily transferred to another section where such procedures can be observed and practiced. Permanent retention and placement should be decided only after the trainee has practiced all procedures and been examined by his supervisor to insure that he knows them thoroughly. It is the supervisor's responsibility to stimulate improvement before making a second checkout report either indicating satisfactory proficiency in all procedures or recommending termination. There should be a firm administrative policy requiring one alternative or the other. When using a probationary period of 90 days or less, transferring a trainee to another supervisor before probation is completed is very unwise. Unsatisfactory trainees have lasted for months or years in hospitals condoning this supervisory "passing the buck" method of relocating an undesirable.

Employee Recognition

Maximum use must be made of superior proficiency to benefit both the hospital and the individual. Individuals who rate above average in work performance but are otherwise not acceptable for supervisory training should have first preference for periodic salary increases in nonsupervising categories. (See Work Evaluation.) Persons in the average group should be considered next, and so on. Work areas should be rated according to their difficulty and the high-performance group assigned to the more critical areas such as first floors, surgeries, and pediatric wards. These placements must be understood to be a mark of recognition for superior ability.

Training of Supervisors

The executive housekeeper, as a second line supervisor, usually represents housekeeping management and in larger hospitals does little or no direct supervision of workers. He delegates some of this management function to his housekeepers in the proportion each can handle, then attempts to guide their education and training along lines that will promote individual capacity for decision-making. This implies that the executive housekeeper has a large store of practical experience and that from this experience and his own training he has derived valid fundamentals. He must use these not only for training and work implementation but also to guide his own further development in an advancing technology. An executive housekeeper must have a broad knowledge of the basic *principles of* housekeeping; be aware of probabilities regarding type, degree, and patterns of soiling; be cognizant of various methods and types of equipment, their limitations and possibilities; and have a firm grasp of training needs, job requirements, and personnel qualifications. In particular, he should be able to use and explain the principles of work measurement in housekeeping and to base his program upon them. Housekeeping supervisors must know these

principles too, but in less breadth and for more specific application to their own areas of responsibility. Housekeeping workers are taught principles as they apply specifically to individual work procedures.

Adequate supervision is the key to overall success of the program. Relying on the worker's own judgment or common sense about when *not* to do the job is an invitation to trouble. Regardless of proficiency or enthusiasm, the worker will seldom realize why housekeeping efficiency must sometimes be sacrificed to avoid disrupting nursing routine or other patient care operations, creating safety hazards, causing unnecessary noise or discomfort to patients, or unnecessarily impeding traffic.

Supervisory training is the most neglected area in hospital programs, so delegation of management responsibilities to line supervisors in all departments is curtailed to the point where inadequate development results. Porters and maids occasionally are promoted to working foremen or assistant housekeepers, but the usual practice, unfortunately, is to hire someone from outside. The theory seems to be that the outside person has supervisory experience and can then be trained to apply it to housekeeping technology. When promotion is from inside the hospital, the ex-maid or porter is usually given very little management training specifically designed to overcome educational and supervisory handicaps. Supervisory training should:

1. Help the supervisor do his job better
2. Seek to bridge the gap between what the supervisor is and what the progressive executive housekeeper would have him become
3. Be oriented toward both immediate and long-range goals of the hospital, not merely short-range needs
4. Be a mental conditioning experience in the principles, theories, and knowledge upon which housekeeping management is based

In accordance with these principles, the executive housekeeper should constantly remind himself that he cannot develop people, that development results from opportunity, plus the necessary guidance. In particular, delegation of some decision-making is a prime instrument in the development of a supervisor.

SELECTION OF SUPERVISORS

When possible, selection for promotion should be from within, based upon ability and seniority. Seniority should be considered only when other factors are equal, since the ability to do housekeeping work cannot be equated with the ability to supervise it. Candidates for promotion, as well as all other personnel, should be informed that promotion to supervisor is on a probationary basis for a specified time, just as it would be for a new employee.

Criteria for promotion candidates should include:

1. Assessment of candidate's past written record
   a. Absence and tardiness record
   b. Cautions and warnings incurred
   c. Written commendations
   d. Sick leave record review
   e. Rating form record, particularly on-the-job training performance and comments by supervisor
2. Education
3. Ability to explain the rating system and method of work allocation
4. Breadth of work knowledge. (A houseman supervisor candidate should be able to explain and demonstrate a houseman's work.)
5. Good capacity for observation and reasoning
6. Ability to relate effectively to other workers
7. Performance on a written supervisory test, if possible

Span of Control

Span of control is relative, always debatable, and depends to a large extent on the ability of the individual supervisor, but there are reasonable minimums and maximums that may be suggested:

No departmental responsibility—day shift—inpatient—12 to 18 workers

No departmental responsibility—evening shift—general—15 to 20 workers

Some departmental responsibility—day shift—inpatient—8 to 12 workers

Some departmental responsibility—evening shift—general—8 to 10 workers

The figures above are for hospitals of 125 beds or more with an executive housekeeper who does no direct supervision, except to fill in for housekeeper assistants on their days off. In smaller hospitals, where the housekeeper is a supervising department head with an assistant to share departmental responsibilities, each one can supervise 8 to 10 persons. If the housekeeper has no assistance with administrative responsibilities, control should be limited

to less than 8 workers. In government hospitals, organizational tables largely determine the staffing pattern.

WORK EVALUATION

Supervision involves not only the overall evaluation of employees' work performance but also keeping employee records that reflect such factors as absence, tardiness, degree of interest, cooperation, personal appearance, and quality of work. These observations should be as objective as possible. Specific instances involving these factors should be recorded so that the worker will understand what the supervisor is referring to when commending or reprimanding. A thorough explanation of the work rating system should be included as part of the training program. Providing each worker with a printed form will enable him to know on what basis he is being rated. In general, personnel will accept the rating procedure if it is understood that it is applied at other organizational levels.

It is essential to the success of any rating procedure that all supervisors have a complete understanding of the procedure, frequency of ratings, and the criteria for each rating item. A wide variety of rating forms are in use in hospitals; several samples appear in appendix A.

Personnel ratings are usually performed at periodic intervals according to the policies of the hospital. In order to increase the reliability of such ratings, it is essential that observations and periodic appraisal of the employee's work be recorded. Rating forms based on the tasks performed as part of the duties of a job are helpful.

Any unusual decline in the quality of any housekeeping service may be due to the rotation of personnel to a new area, shortcomings in training, lack of supervision and competent observation, indifferent individual performance, or varying combinations of these factors. When such situations are observed with any frequency by medical or administrative personnel, and reprimands given to the housekeeping department, the total program suffers and personnel changes at the supervisory level usually follow.

One danger to be avoided is that of using the amount of time spent in an activity as the only criterion of performance. The fact that a given procedure is accomplished "faster" in a given appraisal period than on previous occasions should not automatically be equated with better performance. Such an approach omits many variables that influence results. Among these are the difficulty of the cleaning situation, inaccurate average work times, inaccurate definitions of cleaning quality goals, and differences in individual ability. A subjective evaluation of overall cleaning quality, based on supervisory judgment, becomes unavoidable.

CARE OF EQUIPMENT

The basic information on equipment care presented in chart I is adapted from a recent handbook.

SAFETY ASPECTS

Safety training should be an integral part of job training of all hospital employees. The following safety fundamentals apply particularly to housekeeping services:

1. Personnel should be supplied with rubber gloves and urged to wear them when using strong cleaning chemicals, disinfectants, and abrasive agents such as steel wool.

2. Housekeeping equipment should be inspected to see that handles are smooth and that wires and switches of electrical equipment are in good repair.

3. All ladders should be in good repair.

4. Scaffolds should have railings.

5. Personnel should wear safe, nonslip shoes.

6. All housemen and porters should be given instruction in body lifting mechanics and efficient methods of handling floor machines and heavy equipment.

7. Those who do high dusting or ceiling cleaning should be equipped with plastic eye shields.

8. Maids and porters who enter isolation rooms should be instructed by the floor nurse on protective procedures in each instance.

9. When employees are mopping, scrubbing, waxing floors, or working on ladders or scaffolds in traffic or working areas, appropriate warning signs should be posted to route traffic around the work area. Other staff and patients should move or be moved away from the work area.

Chart I. Equipment Care*

MANUAL EQUIPMENT:	
1 Buckets and Wringers	Mop bucket, dolly, and wringer should be cleaned daily . . Clean and oil casters on dolly and replace casters when defective . . Oil all working parts of wringer regularly . . . Replace bumper strips on dolly when necessary
2 Wet Mops	Do not twist mop when wringing . . . Clean mop, rinse and wring out after each use . . Use mop holders when storing mops so mop heads do not touch floor . Use proper size mop wringer.
3. Window Squeegees	Wash and wipe dry after each use . . Adjust blade tension or replace blades as required . . . A squeegee is a professional tool—treat it as such.
4. Sponges and Chamois	Wash and rinse out after each use . . . Store on rack to allow for complete drying
5. Dust Mops	Spray dust treatment with electric sprayer . . . Place in covered container . . . Do not use on wet or oily floors . . Replace mop head when soiled . . . Launder soiled mop heads, dry and re-treat
FLOOR MACHINES:	
1. Mount brushes by hand	Make sure that switch is off . . . Do not run machine over brush and attach by starting motor . . . Start machine only when brush is securely locked on . . . Use proper brush for the job.
2. Care for electric cord	Prevent machine from running over electric cord . . . Inspect cord frequently for damage, fraying, etc. . . . Wipe cord after each use with damp cloth and dry thoroughly . . . Wind cord loosely around hooks on machine when not in use . . . Remove plug from outlet carefully—do not jerk cord.
3. Schedule periodic inspection	Should be done by qualified electricians or maintenance men . . . Don't allow minor repairs to grow into major overhauls . . . Scheduled inspections will prevent "down time" and costly repair bills.
4. Care for brushes	Remove brushes from machine when not in use . . . Hang brushes up or lay on shelf with bristles up . . . Wash brushes when soiled in warm detergent solution . . . Do not saturate wood backs . . . Dry with bristles up . . . Keep adapter plates tightened.
5. Clean and lubricate	Wipe machine with cloth dipped in germicidal-detergent solution . . . Keep motor and electrical equipment dry . . . Oil mechanical moving parts and lubricate motor . . . Polish all metal parts . . . Store in safe location.
WET PICK-UP VACUUMS	
1. Use correctly	Start vacuuming next to machine . . . Work away from machine, so that hose and cord follow you . . . Do not back into machine . . . Use proper tools.
2. Care for electric cord	Wipe cord with damp cloth after each use and dry thoroughly . . . Inspect cord regularly for damage, fraying, etc. . . . Prevent machine from running over cord . . . Wind cord loosely around top of machine when not in use.
3. Schedule periodic inspection	Secure needed adjustments or repairs . . . Have work done by qualified electricians or maintenance men . . Neglect of minor repairs or adjustments will cause major "down time" and expense.
4. Clean and lubricate	Wipe machine inside and out with cloth dipped in germicidal-detergent solution . . . Empty and dry tank after each use . . . Clean and oil casters . . . Lubricate motor according to manufacturer's directions . . . Store vacuum with top removed for thorough drying.

* Chart from *21 Hospital Housekeeping Procedures*, 2d ed. Pittsburgh: Graphic Press, 1964, p. 40.

10. Electrical cables for floor machines should not cross corridors, doorways, elevator landings, or other traffic lanes unless such lanes are blocked to traffic.

11. Carts, mopping dollies, and buckets should never be left where they cannot be easily seen.

The executive housekeeper meets his safety responsibilities by providing his personnel with safe equipment, training them in work methods safe both to themselves and others, and providing materials that add to safety, such as nonslip floor finishes. However, he can contribute even more to the safety program by encouraging safety inspections to be included with work inspections of surfaces, fixtures, windows, and doors. While housekeeping personnel are checking their cleaning work, they are in an ideal position to notice adverse conditions before they become hazardous and to report them with their cleaning inspection report. This is true not only in patient care areas but equally to furnishings in corridors, waiting and reception rooms, and personnel locker room facilities. The administrator, however, should make it very clear to the housekeeping department and to the hospital engineer whether this reporting practice is to be a voluntary service or a responsibility with authority to request repairs where needed.

Safety committees have their value in organizing safety programs, analyzing problems, and recommending improvements. Under no circumstances should they cross a line of authority to take direct action regarding hospital personnel within a departmental area. By the same token, supervisors cannot abdicate their safety training responsibility in favor of the safety committee.

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SAMPLES OF WORK SCHEDULE AND FORMS

SAMPLE WORK SCHEDULE: HOUSEMEN

1. One entire floor per day is wet mopped and buffed with lambs wool pad. Employee(s) assigned to this task have the following basic schedule:

7:30 A.M.	CHECK IN HOUSEKEEPING OFFICE *IN UNIFORM*
7:35	SITTING ROOM—WET MOP AND BUFF
7:45	CONFERENCE ROOM—WET MOP AND BUFF EXAMINING ROOM—WET MOP AND BUFF
8:15	PATIENT ROOMS—WET MOP AND BUFF
11:45–12:30 P.M.	LUNCH
12:30 P.M.	NURSES' STATION—WET MOP AND BUFF
1:00	PATIENT ROOMS—WET MOP AND BUFF
2:00	CORRIDOR—WET MOP AND BUFF
3:20	PORTER'S CLOSET—CLEAN EQUIPMENT AND CLOSET—CHECK WORK & REPORT
3:50	CHECK OUT *IN UNIFORM* IN THE HOUSEKEEPING OFFICE

2. Other housemen not scheduled for complete mopping and buffing assignments have following basic schedule:

7:30 A.M.	CHECK IN HOUSEKEEPING OFFICE *IN UNIFORM*
7:35	TREATMENT ROOMS—DAMP MOP ALL FLOORS
8:00	UTILITY ROOM—WET MOP FLOOR
8:15	EXAMINING ROOM—WET MOP FLOOR
8:30	CONFERENCE ROOM—DAMP MOP *(4th, 5th, 6th, 7th Floors)*
8:45	UTILITY ROOMS—WET MOP FLOORS EXAMINING ROOMS—WET MOP FLOORS
11:45–12:30 P.M.	LUNCH
12:30 P.M.	PATIENT ROOMS AND CORRIDORS—SPOT MOP ALL FLOORS
3:30	PORTER'S CLOSET—CLEAN EQUIPMENT AND CLOSET—CHECK WORK & REPORTS
3:50	CHECK OUT *IN UNIFORM* IN THE HOUSEKEEPING OFFICE

SAMPLE WORK RATING FORM

LOCATION: Lab Floor SQ.FT. 18,000

AREA: Offices WORK HRS. 160

Classification	RANGE OF QUALITY				
	Poor	Fair	Good	Excellent	Totals
1 Floors	1–2	3–4–5	6–7–(8)	9–10	8
2 Walls, Doors	1–2	3–4–(5)	6–7–8	(9)–10	9
3 Washrooms	1–2	3–4–(5)	6–7–8	9–10	5
4 Furniture, Lockers, Files	1–2	3–4–5	6–7–(8)	9–10	8
5 Windows	1–(2)	3–4–5	6–7–8	9–01	2
6 Window Shades, Blinds	1–2	3–(4)–5	6–7–8	9–10	4
7 Lighting Fixtures, Fans	1–2	3–4–(5)	6–7–8	9–10	5
8 Equipment, Supplies	1–2	(3)–4–5	6–7–8	9–10	3
9 Elevators, Stairs	1–2	3–4–5	6–7–8	9–(10)	10
Quality Rating Range	9–18	27–45	54–72	81–90	
Total Score	2	17	16	19	54

WORKER E. Smith RATING: Good

Time Inspected ____ A.M. 2:00 P.M. Supervisor A. Jones (Signature)

Each area is broken down into its elements on the form. Each of these is rated by a numerical value in a quality range from Excellent to Poor. In the Fair and Good categories, a range of three quality points permits plus or minus designations. On the sample form, the total score of 54 is at the lower end of the Good rating, or Good-Minus. Line 8, "Equipment, Supplies," includes all equipment. Deficiencies in cleaning any medical, surgical, pediatric, or other specialized equipment can be noted on the back of the form, as can other notes made by the rater.

INSTRUCTIONS FOR MARKING WORK RATING FORM

Range of Quality

Excellent: A condition indicating continuous care and attention; appearance can be improved very little if at all

Good: A condition indicating fairly consistent care and attention, though improvements can be made

Fair: A condition indicating laxity and neglect over a comparatively short time, which can be corrected without major effort involving extra materials, equipment, and personnel

Poor: A condition indicating almost complete neglect over a long period requiring major effort to correct

Penalty Factors

(a) Surface smudges, spots, and easily removable stains and marks

(b) Light soil buildups, films or tarnish

(c) Imbedded soil, marks, stains, or tarnish which can be removed without removing finish

(d) Heavy buildups of soil; buildups imbedded in paint, floor finish, requiring removal of finish; heavy tarnish

(e) Lack of protection to surface lustre because of insufficient finish, polish, or buffing

Depending on the extent of each factor, (a) and (b) usually indicate problems in the daily routine, (c) problems in the weekly routine, and (d) and (e) problems in the longer-term periodic work. Specific comments can be made on the back of the form. Usually three or four spot checks of the same area are necessary before discussing results with the area housekeeper or worker.

QUARTERLY PERSONNEL RATING CARD

Date_____

Worker:_____ Classification: (Maid, Houseman, Aide, etc.)_____

YEAR	QUARTER	SICK LEAVE	LATE	ABSENT	UNSATISFACTORY REPORTS	CLEANLINESS				INITIATIVE				INTELLIGENCE				COOPERATION				KNOWLEDGE OF PROCEDURES				WORK QUALITY				WORK QUANTITY				E = Excellent G = Good F = Fair P = Poor
						E	G	F	P	E	G	F	P	E	G	F	P	E	G	F	P	E	G	F	P	E	G	F	P	E	G	F	P	SUPERVISOR COMMENTS
	1																																	
	2																																	
	3																																	
	4																																	

NOTE: Entry under "Work Quality" to be entered from rating on Work Rating Form or from average of totals if more than one Work Rating Form is filled out in a single quarter.

INSTRUCTIONS AND CRITERIA FOR COMPLETING QUARTERLY PERSONNEL RATING CARDS

Year

Current year

Quarter

Current quarter

Late

Enter arrivals over 10 minutes late, except lateness beyond control of employee

Absent

Number of absences for quarter, not excused in advance, and not beyond control of employee (NOTE: Breakdowns in transportation due to adverse weather, sudden emergencies in family, etc., are considered beyond control of employee. These situations are to be judged at discretion of supervisor.)

Unsatisfactory Reports

Number of unsatisfactory reports submitted to executive housekeeper for quarter

Cleanliness

Excellent: Always wears clean uniform, always has hands, face, and nails clean, odor free
Good: Occasional dirty uniform
Fair Occasionally dirty hands or face, or dirty uniforms
Poor: Frequently dirty (or unshaven) or wears dirty uniforms

Initiative

Excellent: Can be depended upon to handle all emergency situations not covered by instructions. Observes when it is necessary to change his routine or method to handle changed situations. Does more work than required of him when he thinks it is necessary.
Good: Frequently attempts problem solving and can be depended upon to handle most emergency situations not covered by instructions.
Fair: Occasionally attempts to handle emergency situations in absence of supervisor, occasionally attempts problem solving
Poor: Never makes any attempt to handle new situations or unexpected developments in the absence of a supervisor. Never attempts problem solving of any kind. Never attempts to handle emergency situations.

Intelligence

Excellent: Understands all instructions and explanations. Is able to think out problems for himself, or brings up problems to supervisor and works them out. Is able to plan own work to some extent and suggest improvements. Rarely needs retraining.
Good: Understands instructions and explanations readily. Needs very infrequent retraining
Fair: Needs frequent explanations and instructions. Does not understand quickly or retain training.
Poor: Does not understand orders, instructions, and training unless repeated many times. Forgets instructions rather easily

Cooperation:

Excellent: Very cooperative. Always reports problems to supervisor and even suggests answers. Never resents changes in work, either in type or quantity, and expresses difference of opinion to supervisor in a diplomatic manner. (Subordinates self completely to work.)
Good: Cooperative. Reports all problems to supervisor and asks for advice. Never argues about orders or instructions he does not agree with. Rarely resents changes in work. (A good follower.)
Fair: Uncooperative occasionally. Occasionally reports problems to supervisor and asks for advice. Argues infrequently, resents changes in work and alters instructions he does not agree with, but does not refuse them. (Partially accepts leadership.)
Poor. Very uncooperative. Does not report problems to supervisor Argues frequently, resents changes in work, and tends to refuse orders or instructions he does not agree with.

Knowledge of Procedures

Excellent: Knows all standard work practices in his or her category and is very proficient in the use of all equipment Recognizes method and equipment to use in any cleaning situation and rarely asks advice.
Good: Knows all standard work practices in detail in his or her classification but needs some further training to obtain full proficiency with equipment used.
Fair: Knows enough of standard techniques in his or her classification to work only with continued training and observation.

Poor: Knows none of approved work techniques used by housekeeping department. Knows very little about cleaning in general. Needs complete training.

Work Quality

To be evaluated by use of Work Rating Form

Work Quantity

Excellent: Sets own good pace with little need of supervisory observation.
Good: Maintains good working pace without being pushed by supervisor.
Fair: Needs frequent pushing by supervisor to maintain good working pace.
Poor: Even when pushed by supervisor, cannot maintain a fair working pace.

Supervisor Comments

To be used only for exceptional entries, good or bad, such as:
"Shows little interest in this work"
"Shows exceptional interest in this work"
"Shows supervisory ability"
"Given warning this date on poor rating in attendance"
"Warned about poor ratings for quarter"

Poor is equivalent to an unsatisfactory rating. A new employee may rate in the Poor column for the first quarter if he has been employed less than a month. Other than this, no mark below Fair is acceptable in any rating category. If the reason for the Poor rating can be discovered and the employee understands how to correct it, only a warning should be given, otherwise, disciplinary action may involve reduction of salary or dismissal. Two consecutive Poor marks in any one category may mean automatic dismissal. The important point is to discover why a rating is low and to get the employee to see how to correct it. Specific incidents should always be used to point out the deficiency being referred to.

Absence and unexcused lateness is frequently a good indicator of individual attitude toward the job or of employee group morale. An individual case or two can be handled on a personal basis, group deficiencies indicate supervisory shortcomings.

Two unexcused latenesses can be counted as equal to one unexcused absence in value, and any combination of unexcused lateness and absence equaling three absences during one quarter may be cause of immediate dismissal.

Consistent Good and Excellent ratings should be commented on by supervisors to the employee, in addition to serving as the administrative basis for pay increases or promotions.

The application of the rating system suggested above is only one method that has proved effective in practice. Local circumstances of hospital policy, union contracts, or particularly, the restrictions imposed by government-operated hospital personnel systems will require modification in application. Basic rating forms and their marking instructions can be useful in most systems, despite necessary variance in application.

EMPLOYEE PERFORMANCE APPRAISAL FORM

Date of Employment _____

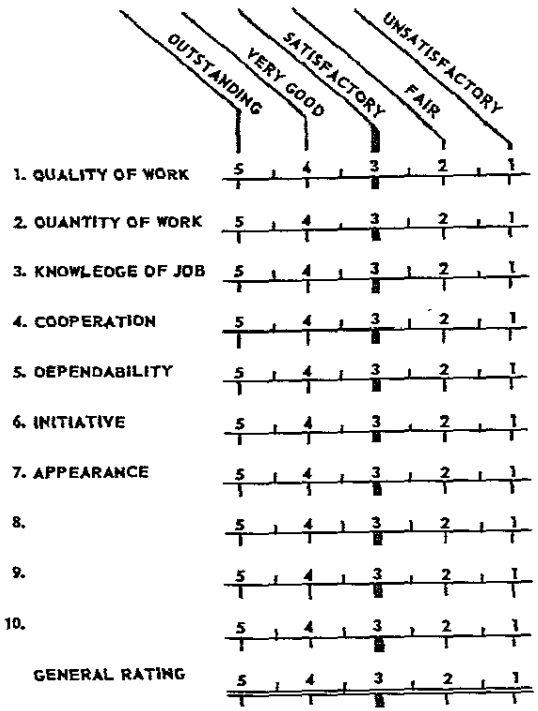
Employee's Name _____

JOB TITLE _____ DEPARTMENT _____

DEPT. NO. _____

RATING: 90 Day ☐ 6 Months ☐ Annual ☐ Merit Increments ☐ Other _____

Rate by marking "X" on each scale. Connect "X"s" with a profile line. Add up point values of ratings and divide by the number of ratings. Place the average on the GENERAL RATING SCALE.



SUPERVISOR'S REMARKS

Supervisor _____ Date _____

EMPLOYEE'S COMMENTS

Employee _____

DEPARTMENT HEAD - COMMENTS

Department Head _____

SUGGESTED DEFINITIONS -- *EMPLOYEE PERFORMANCE APPRAISAL FORM*

NORM: *"Satisfactory" is the level expected of the average, qualified worker in that job.*

1. QUALITY OF WORK:
   Accuracy, thoroughness, neatness, dependability of results, frequency of errors, the extent to which errors are repeated, the amount of checking that is required to avoid errors. Where applicable, the manner in which work or service is performed in patient and public service.

2. QUANTITY OF WORK:
   Volume of work. Speed and efficiency considered as they result in work completed.

3. KNOWLEDGE OF JOB:
   Understanding of duties and job processes in the job description, knowledge of relationships to work of others and their importance. in patient care.

4. COOPERATION:
   Relationships with fellow employees, supervisors and public -- a team worker.

5. DEPENDABILITY:
   Promptness, attendance, responsibility, and interest in work. Dependability in carrying out hospital regulations and procedures. Responsiveness in emergencies.

6. INITIATIVE:
   Degree of independence in continuing assigned work, constructive suggestions, voluntary assistance to other employees and to visitors.

7. APPEARANCE:
   Suitable to hospital environment and the job.

TO ALL SUPERVISORS:

Please answer the following questions before returning this evaluation to the Personnel Office:

1. Have you made this particular evaluation *for this rating period only* according to the duties listed on the Job Description now in the files of the Personnel Office? YES ☐ NO ☐
2. Have you assigned additional duties and/or changes in duties which should be included in this particular job description since the last evaluation? YES ☐ NO ☐
3. If "Yes" is the answer to question No. 2 above, please notify the Personnel Office of these changes immediately, also inform the employee of these changes or additions in duties in order to avoid future misunderstandings regarding work assignments.

Chapter II

SOLID WASTES HANDLING

Ralph J. Black

THE DIVERSIFIED TYPES of solid wastes that must be stored, collected, and disposed of in the operation of medical care institutions create problems that should be recognized early in the planning process. Adequate facilities for the types and amounts of waste that must be handled; the location and design of waste chutes, and design of waste rooms; whether separate facilities are to be provided for the disposal of surgical and autopsy wastes; and the method of disposal are all essential factors to consider for both new or remodeled facilities. Consideration should be given to on-site incineration or hauling for off-site disposal, with emphasis on the placement and type of incinerator if incineration is chosen. Suitable storage, collection, and conveyance systems must be evaluated, keeping in mind such factors as the size of waste containers, facilities for cart and/or container washing, whether garbage grinders can be used, or whether a refrigerated room must be provided for storing the garbage until removed.

TYPES AND VOLUME

The principal types of solid wastes are: (1) garbage, (2) paper, trash, and other dry combustibles, (3) treatment room wastes, (4) surgery wastes, (5) autopsy wastes, (6) noncombustibles such as cans and bottles All containers and equipment should be readily cleanable, small enough for one man to handle easily when full, covered as tightly as practicable until filled, and constructed to create as little noise as possible during handling. Ideally, collection must create a minimum of disturbance, yet be scheduled frequently enough to minimize accumulation of odors and prevent overloading of storage, transportation, and disposal equipment.

Solid waste handling systems should prevent airborne contamination, vermin attraction, and odor production. The system should encourage neatness and good housekeeping, and present no safety hazards to the institution or its employees. It is particularly noteworthy that studies of the microbiological contamination of hospital air showed the heaviest contamination in waste storage and disposal areas, particularly in chute closets.[1] In view of the well-documented difficulties experienced in controlling hospital-acquired infections, good supervision must assure that the most scrupulous housekeeping standards are maintained in handling solid wastes.

Average weight and volume of solid wastes have been given by several workers as between 7 and 8½ pounds, and about 0.7 cubic foot per patient per day. Unfortunately, there is no reliable current information on average refuse production. The increasing use of disposable items has undoubtedly altered former average figures on types and quantities and has affected incinerator loadings. The problems inherent in safely disposing of such items as syringes, examination gloves, catheters, emesis basins, and petri dishes by means of outdoor storage and municipal collection, involve special safety considerations for staff, collectors, and the public. There are legal implications as well. For example, used syringes recovered from landfills or dumps by children who play doctor or use them for darts, or by narcotics addicts for less innocent purposes, may leave the hospital liable for legal action through failure to destroy or safely dispose of them.

Most existing data on waste type and volume are

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calculated on a pounds-per-patient-per-day basis. There are shortcomings in using the patient day as a unit for estimation, however. It has been suggested that a better correlation can be obtained by using an equivalent population computed from total patients, resident and part-time staff members, and estimated visitor load. Charts II and III, using the equivalent population basis, show the results of one waste production survey.

Single-service plastic waste receptacle liners or moisture-proof paper bags with special holders are preferable to unlined metal containers with their attendant sanitizing requirements or cloth bags which require laundering. Specially designed

Chart II. **Hospital Noncombustible Wastes Production on Volume per Capita per Day Basis***

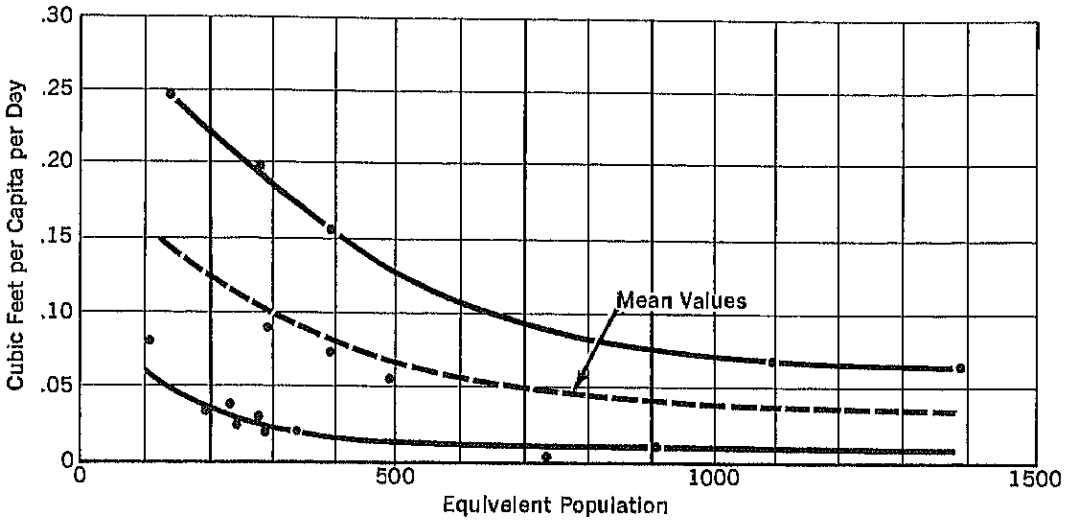
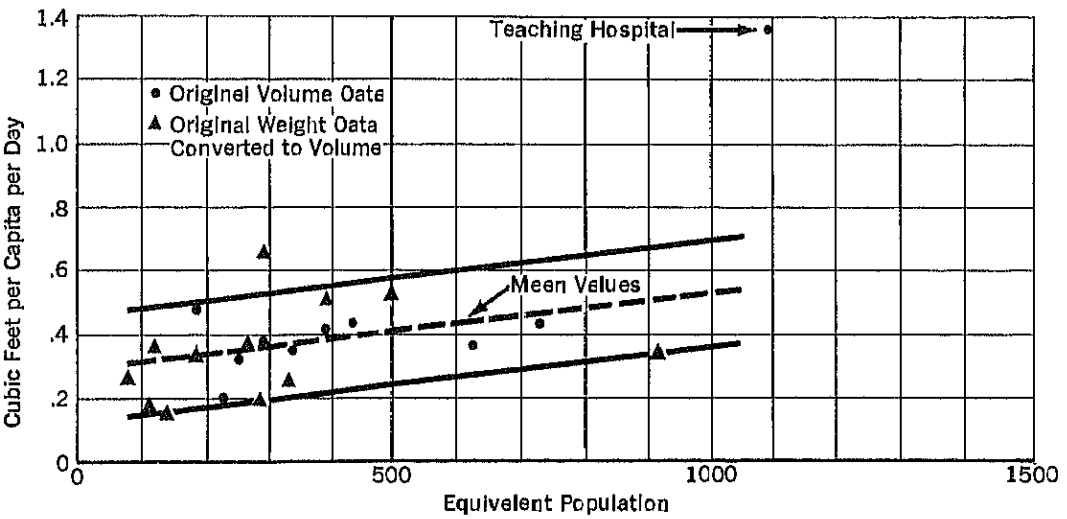


Chart III. **Hospital Combustible Wastes Production on Volume per Capita per Day Basis***



* *American Journal of Public Health*, 46:362, March 1956, copyright 1956 by the American Public Health Association, Inc.

single-service cardboard cartons have also been used successfully. (See figures 3 and 4.)

Trash chutes should discharge to a trash receiving room separate from the incinerator charging areas, and the receiving room should have exhaust ventilation. Chute loading doors should be located in soiled-equipment areas or in closets separated from corridors or clean areas. Charging doors should be protected with electric interlock systems to prevent the opening of more than one door at a time, and should be tightly fitted with flexible gasketing to minimize the spread of aerosols from the chute. Chutes and trash receiving rooms should have adequate sprinklers for fire protection, and incinerator operating periods should be scheduled to minimize trash buildup in both areas. (See figure 5.)

The use of single-service container liners, paper bags, or cardboard cartons reduces aerosol spread, eliminates odor and noise produced in transferring the refuse, and achieves better vector control because the metal supports or receptacles do not accumulate much gross soil. Rupture of plastic bags of 0.0015 to 0.0020 gauge has been reported as infrequent even when used for cans and bottles. Overloading, however, particularly with wet garbage, must be controlled by staff training and supervision. After filling, liners should be closed with rubber bands or stapled. Paper bags are less liable to rupture but have thus far been employed in relatively limited quantities. (See figure 6.)

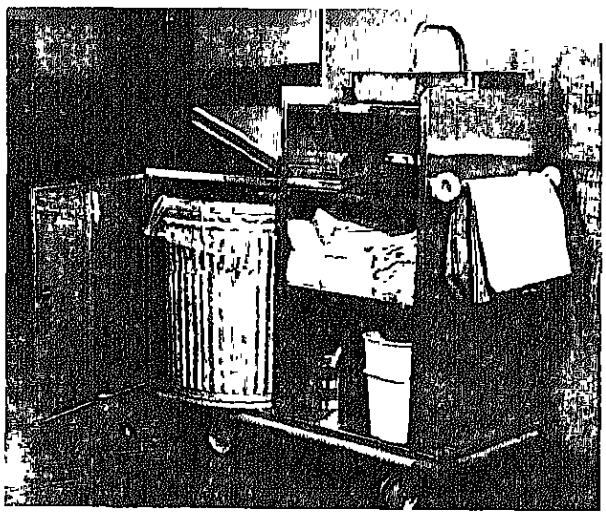


Figure 3. **Housekeeping cart with bulk container lined with plastic bag.**

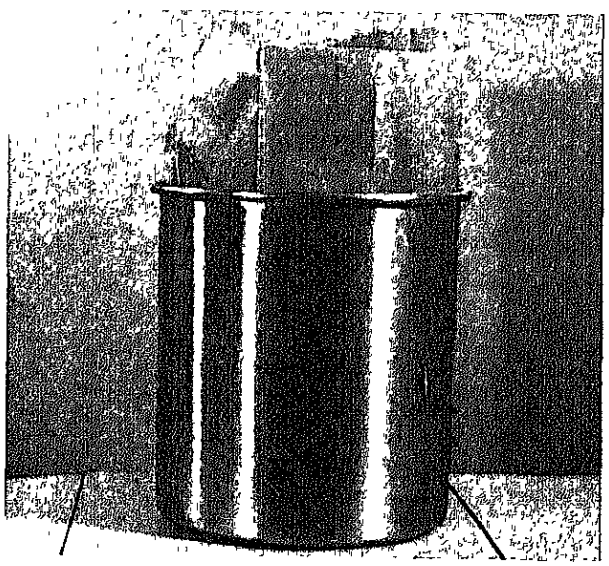


Figure 4. **Trash receptacle from isolation room showing impervious paper liner. Receptacles from non-isolation rooms should also be lined.**

Figure 5. **Trash chute receiving room should be separate from charging area, fire sprinklered and, if possible, have hose bibs to permit periodic scrubbing.**

Figure 6. **Paper bag for bulk trash collection mounted in special holder with stapler for closing.**

Plastic bags for larger (27 to 33 gallon) containers may not feed readily through waste chute doors; the use of smaller containers and bags or small cardboard cartons may be necessary. Metal containers from which liners are removed should have closely fitting lids, either detachable or of the hinged, foot-operated type. Containers should be constructed without open seams or crevices for easy cleaning. The container and cart-washing facilities should be located as close together as possible so that the same hot water and steam supply can be used. If steam is used, it must be under pressure to be effective in open containers or for carts. Whether 180° F. water or steam is used for sanitizing, a thorough initial hot water wash with detergent is necessary to remove the gross soil from containers. The operation should be mechanized as much as possible to reduce labor and to encourage frequent washing of this equipment. (See figures 7 and 8.)

Although impervious liners reduce the necessary frequency for sanitizing containers, all containers and the carts on which they are transported should be cleaned routinely, as frequently as facilities permit, without waiting for accumulation of clearly visible gross soil. Fabric hampers, if used to transport sealed liners, should be laundered on alternate days. They should *never* be used for carrying pathogenic wastes.

GARBAGE DISPOSAL

Many institutions use garbage grinders. But in some areas, local ordinances prohibit the use of commercial, heavy-duty garbage grinders of the type best suited to institutional use. Special agreements, which sometimes include a service charge to cover the additional sewerage treatment load, have been negotiated between local authorities and hos-

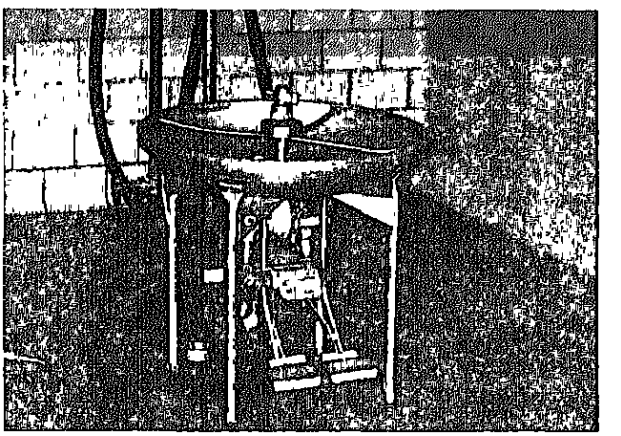


Figure 7. **Can cleaner with 180°F. water connections.**

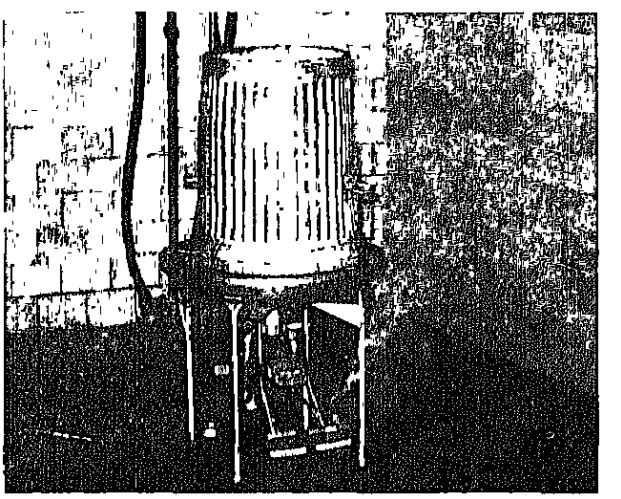


Figure 8. **Can cleaner with can positioned for cleaning.**

pital administrators. The use of grinding units for disposing of placental wastes and other hospital service department wastes, as well as the more customary kitchen wastes, should be evaluated.

An approximate guide for estimating commercial disposer capacity in kitchen uses is shown below:

Horsepower	½	¾	1½	3
General capacity lbs/hr	200	400	1,200	2,000
Up to number of persons per meal	125	300	1,500	1,500 plus

The pounds-per-hour capacity is based on use of a special mixed waste developed as a military specification.

The size of grind is important in making the discharge acceptable for handling in the sewerage treatment system. The following specifications are based on the military specification used in table III:

1. 40 percent of discharge must pass a No. 8 sieve.
2. At least 65 percent shall pass a No. 3 sieve.
3. 100 percent shall pass a ½" sieve.

Table III. **Basis for Determining Pounds-Per-Hour Capacity of Disposer***

Material	Approximate Percent Drained Weight
Uncooked beef or pork bones not over 1½" diameter	10
Uncooked poultry bones	10
Grapefruit rinds cut in half	15
Green beans, cooked	5
Turnips, cooked	5
Spinach, cooked	5
Whole beets, cooked	4
Banana skins	10
Lettuce leaves, raw	10
Raw vegetable trimmings	5
Raw celery stalks	5
Corn husks	5
Potato peelings	5
Paper napkins	4

* Specifications Military—G-1584OB, Para. 4.1.1.1.

The unit should be approved by Underwriters Laboratory and installed with a backflow prevention device. The impellers and fly wheel should be corrosion and jam resistant; the motor of ball-bearing, sealed design; and the unit should have an inlet deflector of neoprene or other approved elastomeric material. Approved sanitary installation principles for easy cleanability and maintenance should be followed

If garbage cans are used, as they are in many dietary facilities on nursing floors, plastic liners are very useful in reducing the amount of gross soil that accumulates in the cans. If garbage must be sorted, rather than ground or incinerated, and hauled away at the end of a shift, refrigerated storage should be provided. This retards spoilage, reduces odor production, and greatly reduces fly and rodent attraction during warm weather. Outside storage of either garbage or rubbish requires containers that are tightly covered, easily cleanable, and positioned on a rack 12 inches off the ground for a single rack of cans, and 18 inches above the ground if a double rack is used. Galvanized pipe of 1½ inch diameter is often used to construct racks because the pipe is durable and easy to clean.

RUBBISH DISPOSAL

Since incineration facilities must be provided for the disposal of infectious wastes, many institutions have built incinerators large enough to handle all their refuse. While enough large cardboard cartons accumulate in large hospitals to warrant flattening and selling them, the local demand for cardboard is variable. Similarly, there may be a minor local market for large-sized tin cans to be used by nurseries to plant trees and shrubs. However, such salvage does not significantly reduce the volume of refuse which must be handled.

Equipment for wet grinding or pulping of refuse, followed by dewatering of the pulp, has been introduced recently. This equipment has the advantage that both garbage and trash can be handled, and since the slurry can be pumped easily, the extracting unit can be located where removal of the dewatered pulp is convenient. Little water is used by these units because the extracted water is recycled. The principal disadvantage of this method is that a damp pulp is produced which is best disposed of by landfilling or composting.

Such specialized problems as destruction of limb or body casts can only be handled in heavy-duty, high-temperature incinerator units after first breaking the casts into small segments. One special

problem which has occurred in institutions having an appreciable amount of bone wastes, such as teaching hospitals which use numbers of experimental animals, is fused phosphorous deposits on grates or bricks in combustion chambers. These deposits, which are much harder than fused glass, are usually removed by periodic chipping or the replacement of some of the brickwork or grates.

HOSPITAL INCINERATOR TYPES

Two principal types of multiple-chamber incinerators are currently in use—natural-draft, and heavy-duty, high-temperature. The latter is preferable because the high temperatures provide safe disposal of pathological and laboratory wastes, wet garbage, and other high-moisture-content materials. The obsolete flue-fed incinerator with direct charging from the waste chute, was convenient because it permitted loading at each floor. But it had a high level of faulty operation and breakdown, created aerosol contamination around flue doors, into hallways and patient areas, and had serious limitations on handling high-moisture wastes. The natural-draft type offers improvement in operating temperatures but little certainty of complete destruction of pathological materials. The high-temperature type of incinerator of either grate or solid hearth construction, with drying shelves for wet wastes and an auxiliary heating unit to insure temperatures of 1200° to 1800° F. is the unit of choice.

There are various devices to aid in controlling particulates in the gases emitted from an incinerator. The settling chamber provides an additional compartment in which fly-ash particles impinge on the surfaces or, if large enough, settle out as the hot gases pass through the chamber. The same effect is usually accomplished by proper design of a multiple chamber incinerator. Design of the secondary combustion chamber and its flue connection should afford a 90° angle, forcing a sharp directional change in the movement of combustion gases. The natural impingement of particles, supplementing that accomplished earlier by the baffles between the primary and secondary chambers, will remove a high proportion of particulate matter. As always, proper charging practices and sufficiently high operational temperatures are also necessary for good results.

A second device for particulate removal is the liquid scrubber or gas washer, operated on these basic principles:

a. Wet impingement—Particulates impinge on baffles with water flowing over their surfaces.

b. Water sprays—Spray jets in the flue breeching wash the gases in passing.

c. Water curtain—A continuous curtain is diverted by baffles through which the flue gases pass.

Particulate removal devices are designed more for air-pollution control than as safety devices to prevent emission of pathogens. Adequate destruction of pathogens is only accomplished by sufficiently high temperatures in auxiliary burning units, and particulate removal should never be viewed as a substitute for high-temperature destruction.

Heavy-duty incinerators can be equipped with a heat-exchange coil to provide hot water or steam for sterilizing waste cans. In many cases, irregular incinerator operating schedules and the relatively low BTU value of refuse, even if no high-moisture material is incinerated, offer marginal benefits. However, one author indicated that in a "fairly large" hospital, heat recovery could mean a saving of $100 or more per month [2] The determination to make the added capital investment necessary to recover waste heat should be evaluated by a qualified mechanical engineer after data on average waste composition have been collected. Local air pollution control requirements always should be investigated before installing or modifying an incinerator installation. Detailed operating instructions should be mounted on the incinerator control panel or nearby wall. The manufacturer's representative should review operating procedures with the engineer or foreman responsible for incinerator operation and maintenance.

Classification systems have been suggested for incinerator types to furnish some guidance in selecting appropriate units.[3, 4]

OPERATIONAL AND SAFETY CONSIDERATIONS

In organizing solid wastes disposal work, supervision must be strict and constant, with the responsibility delegated to one individual. Housemen performing collection and storage work should be carefully trained in protective techniques necessary for the proper handling of pathogenic wastes, such as the use of gloves, gown, filter mask; meth-

ods of handling containers to minimize aerosol spread; and proper closure techniques if liners are used. All wastes from infectious disease cases, including food wastes, should be placed in clearly marked plastic or paper bags and incinerated. Only trained personnel, wearing gloves or other protective items, if necessary, should handle these wastes. Pathogenic wastes from treatment rooms, burn dressing rooms, autopsy wastes, items such as sputum cups and tissues from tuberculosis wards, pathogenic laboratory wastes, and experimental animal tissues all require careful handling of waste receptacle liners, together with strict observation of protective techniques by collecting personnel.

Scheduling of collection must depend on local conditions, but refuse should be removed at frequent intervals in as sanitary and as quiet a manner as possible. Since no firm scheduling of refuse removal from operating and delivery rooms is feasible, frequent checking with supervisors is necessary to provide adequate service. If only one service hall and entrance in the building is available, the food facilities are frequently located nearby. In such cases, refuse removal should be scheduled during periods of the lowest level of food preparation and service. To minimize aerosol hazards and relieve hallways and service elevators of extra traffic, no collection should be scheduled during mealtimes. If flue-fed incinerators are still being used, particular attention must be given to training housemen and others handling wastes not to empty noncombustible or pathological wastes into the chutes. Waste receptacle liners must not be overloaded to the point that the bags are ruptured by forcing them through hopper doors. Liners should be routinely used in kick-buckets in surgery and delivery rooms. Proper training of housemen in the use of waste-can liners or cartons makes it unnecessary to use nursing personnel trained in isolation and protective techniques to handle infectious waste disposal. (See figures 9, 10, and 11.)

Medicines which contain alcohol, empty containers with residual hydrocarbon products, trash saturated with inflammable liquids, and pathogenic wastes all constitute safety hazards if spilled in the incinerator charging process or thrown into a closed-down but still hot incinerator chamber. Transparent face shields are used routinely to protect the eyes of municipal incinerator stokers, and should be used by hospital incinerator operators. Any introduction of material into the incinerator after routine operating hours should be closely supervised. When pathological remains which have been preserved in alcohol are incinerated, additional air must be provided to keep down the heat and smoke generated. The operating temperature should be brought up to about 1700° F. by auxiliary burners and blowers when starting to incinerate a new load of wastes. After the load is charged, the fuel supply should be cut off, but the blowers should be left running to provide sufficient air for good combustion.

In new installations, facilities for vacuum cleaning incinerators, rather than sweeping and shoveling, should be investigated. One municipal-sized operation reported a reduction in work force from 6 to 2 men and cleaning time reduced from 36 to 5 hours a week. Additionally, the vacuum process eliminates the need for workmen to use the protective clothing and respirators required by the manual process.[5]

Safety controls required on gas-fired incinera-

'gure 9. **Bulk waste can with plsstic liner for wastes from isolation ares. Smaller individusl can liners from patient rooms are placed in lined larger can.**

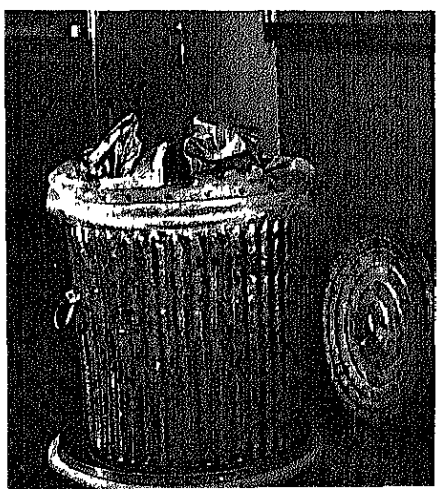


Figure 10. **Houseman closing neck of liner before fsstening. Note thst proper sized liner cuff permits enough slack for adequste closure without compressing waste inside.**

Figure 11. **Both fnstened liner and tigh fitting can lid are tagged with warnii tag to protect subsequent handlers a insure adequste disposal of infectio wostes.**

tors should be (1) draft indicators, (2) pilot light solenoid, (3) low voltage release relay on blower, and (4) damper interlock. All these safeguards should be in series with a solenoid shut-off valve in the gas supply line, which will operate upon failure of any of the safety components.

Routine safety inspections by insurance inspectors should be encouraged, since their training makes them sensitive to any installation where a foreseeable set of circumstances might cause accidents or fire.

Some routine operating instructions which prolong incinerator life are:

1. Clean grates and ash pits daily.
2. Keep all draft passages clean.
3. Operate dampers weekly. Pulleys may cease to function because of ash dust.
4. Keep cans, bottles, and other noncombustibles out of the incinerators.
5. Ventilate furnace well before lighting to reduce explosion hazards from accumulated fumes.
6. Don't overload furnace.
7. Keep materials stirred and loose, exposing them to air so they will burn readily.
8. Give a smoking fire more air.
9. Don't strike brickwork with bars or rakes.
10. Learn what types and amounts of wastes may safely be burned without overheating the brickwork [6]

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Chapter III

INSECT AND RODENT CONTROL

Wilfred H. Johnson

THE PROBLEMS of insect and rodent control in the specialized environment of the hospital are sometimes more difficult to solve than in other situations This does not imply that these objectionable, disease-carrying creatures must be tolerated in the hospital or community environment. They can and are being adequately controlled in many hospitals throughout the country.

ADMINISTRATIVE CONSIDERATIONS

Insect and rodent control is an important part of the overall program of preventive medicine in the hospital. It is interrelated with a number of departments, including food service, housekeeping, and engineering. To realize a high level of vector control in the hospital, the program should be the responsibility of a qualified sanitarian or hospital engineer with specific sanitarian training. If on the staff, this person should be chosen for his organizing ability and capacity to work effectively with others as well as for his special training and experience. He should be qualified to make the best choice of chemicals, equipment, and methods of application; to plan treatment schedules and safety precautions; and to train adequately the persons assigned these duties. He should also be responsible for all such control measures which cut across department lines. Especially important when chemical control is carried out by inhouse personnel is the cooperation of the purchasing department. This department should purchase vector control equipment and chemicals only with the advice of the sanitarian or engineer.

If chemical control activities are carried out by a commercial pest control firm, it is a staff responsibility to see that the work is done efficiently and safely. The smaller hospital with limited personnel and resources should avail itself of the services of a sanitarian from the local health department. Another alternative is to obtain the part-time services of a sanitation consultant. Under these conditions, it is highly desirable that chemical control activities be contracted only to a responsible, licensed commercial pest control firm. The sanitation consultant or the health department sanitarian should make recommendations to all involved concerning preventive or source reduction measures aimed at insect and rodent control and should evaluate the work of the pest control firm. (See figure 12.)

ENVIRONMENTAL CONTROL

Flies

Flies are filthy creatures capable of transmitting pathogenic organisms to man. Some may inflict painful bites. Larvae of some species may infest human flesh and intestines.

How are flies to be kept out? Certainly all doors and windows should be screened during fly-breeding seasons. The screens should fit tightly and be kept in good repair. Screen doors should be self-closing, open outward, and should never be propped open. Frequent opening and closing alone may allow appreciable numbers of flies to enter. Service doorways may be equipped with overhead rotary fans to minimize the number of flies that can enter. Copper, bronze, aluminum, or woven plastic screen, having higher initial cost, will be less expensive over a long period than galvanized iron wire which must be replaced as it rusts.

Flies will breed inside the hospital structure.

Mr. Johnson is Chief of the Training Section, Nursing Home Branch, Division of Chronic Diseases, U.S. Public Health Service.

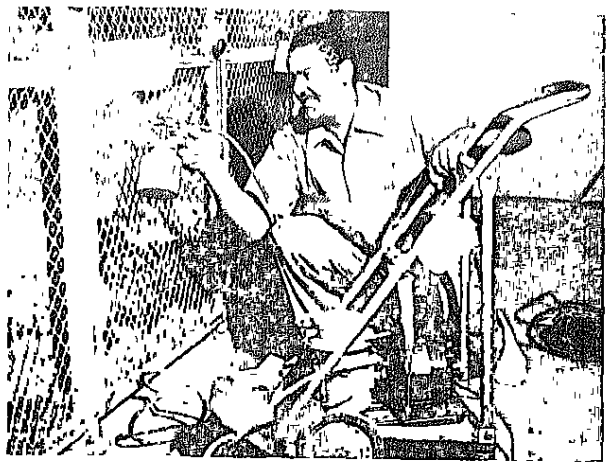

Figure 12. **Spraying to reach corners of laboratory animal cages for ectoparasite control.**

Garbage cans in food production areas, if not adequately and frequently cleaned and stored in refrigerated areas, may provide a place for flies to lay their eggs and for the development of immature stages. Accumulations of grease, crumbs, and dirt in any hard-to-clean places encourage flies. Rotting produce in vegetable storage rooms may permit flies to develop. Strict adherence to good food service practices and housekeeping is vital for the prevention of fly breeding inside care facilities, as well as for the control of other insects, rats, and mice.

Flies may sometimes be kept out by source control methods. When garbage and rubbish is stored outdoors pending collection, the meticulous maintenance of containers and of the storage area becomes especially important.* When proper care and attention are given to outdoor refuse storage areas, the number of flies attracted to the physical plant by odor will be reduced. Actual fly breeding in and around containers will be precluded by proper facilities, cleaning, and maintenance. Especially important is the clear designation of personnel responsibility and good supervision of those responsible.

If the hospital is well screened, if there is no breeding inside or out on the premises, if odors have been eliminated or minimized, and flies are still abundant enough to gain entrance in appreciable numbers, the situation may warrant action on the part of the local health department to limit heavy breeding sites in the vicinity. Community-wide action may be necessary in extreme cases if environmental conditions in the community are conducive to high fly populations. Open dumps; improperly controlled residential, commercial, or industrial waste storage; or animal and poultry farms may be sources of the institutional problem

Mosquitoes

These flying insects cause irritating bites and can transmit diseases such as malaria, encephalitis, and yellow fever. Like flies, they can be kept out of the hospital by maintaining tight screening. Ordinary size mesh fly screening will keep out many mosquitoes and larger flying insects, but in some parts of the United States where smaller flying insects such as gnats, leaf-hoppers, sand flies, and smaller mosquitoes (such as the yellow-fever mosquito) are abundant, 18 x 18 mesh screening is recommended.

Annoyance from mosquitoes may also be minimized by reducing the total numbers in the vicinity. The mosquito life cycle cannot be completed without water. The eggs must be in contact with water in order to hatch, and the larval and pupal stages are aquatic. The time-tested basic rule still applies: eliminate all possible standing water. All water-holding objects around buildings and on the grounds should be eliminated, covered, or perforated so that water does not accumulate. Do not overlook such possibilities as mosquitoes breeding in cooling towers of air-conditioning systems and in clogged rain gutters. Where water cannot be eliminated it can be treated to prevent mosquito breeding, usually by applying a surface oil film or a chemical larvicide. If all mosquito breeding potential on hospital grounds has been eliminated, and mosquito annoyance still exists, hospital administration can be a powerful influence in affecting community action.

Cockroaches

Cockroaches are common in many medical care facilities, often in large numbers. They may mechanically transmit diarrhea and dysentery. Although they have not been proven important carriers of specific diseases, pathogenic organisms may be carried on and passed through their bodies. They damage stored products and may nibble on and crawl over aged or infirm persons. They also pro-

* See Chapter II, Solid Wastes Handling.

duce unpleasant odors, particularly when present in large numbers.

Much can be done toward preventing and controlling roach infestation through concentrated efforts to prevent their entering the structure. It is necessary to watch for and destroy all cockroaches and their egg cases that may come into the institution with food and other supplies and equipment. Personnel in receiving areas should carefully inspect all incoming material. Short training courses in recognition and eradication can often be given to hospital personnel by the local health agency.

Cockroaches may also migrate from substandard refuse storage areas or from more distant locations. This possibility can be reduced by a good building maintenance program and good refuse storage. Maintenance department personnel should make routine inspections of the periphery of all buildings. All cracks and crevices in basement walls and around basement windows should be pointed or caulked. If cracks are large, they should be filled with mortar or concrete. Openings made in both exterior and interior walls for service pipes or other conduits should be filled. Outer building wall breaks should be repaired as soon as possible with mortar or masonry. Inside the buildings, caulking or filling cracks and crevices of door jambs, window frames, and baseboards, and filling in or otherwise making inaccessible any other potential harborage will do much toward achieving effective control.

Meticulous cleanliness in kitchens, bakeries, and associated dining and patient areas is necessary to keep cockroach infestation to a minimum. Staff should not be permitted to eat in laboratories or offices, nor should patients keep food in their rooms. Foodstuffs in food production, dry storage, and other areas should be stored off the floor in tight containers so that they are not accessible to roaches. Good sanitation should extend to places not readily visible, such as under-counter or work surfaces, shelving, cupboards, and closets.

Unfortunately in many hospitals, several circumstances, as outlined below, tend to make frequent, thorough cleaning in every area difficult:

(1) Insufficient funds for enough personnel to accomplish and maintain a high level of cleanliness or inadequate supervision and training of personnel

(2) The necessary use of old buildings with an abundance of structural harborage, combined with poor overall building maintenance that often includes neglect of grouting in tile floors of kitchens and bakeries

(3) Poor arrangement of food production areas and food service equipment, resulting in areas and spaces difficult, if not impossible, to clean

(4) Antiquated and/or poorly designed equipment in other areas

Human Insect Ectoparasites

Ectoparasites such as bed bugs, human lice, and itch mites may occasionally be a problem in hospitals. Admitting staff should be aware of the possibility of lice and bed bugs coming into the institution with the patient and his belongings. Should any admitting physician or other personnel have reason to believe this problem may materialize, provision should be made for examination and treatment before admission to the nursing unit. Head lice have been known to spread from a single patient to a number of other patients under ward conditions.

Mites are sometimes found in dietary facilities and associated areas. Copra itch caused by a cheese mite, which is also found in dried meat, fruit, and flour, can cause discomfort to food service employees. When swallowed in food, the mite causes intestinal irritation. Grocers' or bakers' itch caused by the sugar mite results in an annoying skin irritation. Environmental control measures include the disposal of the infested product, thorough cleaning of possible harborage areas, notification to the supplier, and purchasing policies which require using only sources whose products are produced, stored, and handled under conditions of good sanitary control.

Venomous Insects and Their Relatives

Venomous insects most likely to cause occasional problems include bees, wasps, and beetles. These can be kept out of and away from buildings by: (1) screening, and (2) destroying all wasp and bee nests as soon as they are built in the immediate area. Spiders, scorpions, centipedes, and millipedes may also be troublesome. Spiders are often found in kitchens and associated areas, particularly during the warm season. These can be controlled largely by good housekeeping and by destroying adults, webs, and egg cases wherever found.

Stored Product Infestation

Although not always of primary public health importance, insects are esthetically undesirable.

Those which may cause concern and economic loss through condemnation if the product is extensively infested include:

(1) Beetles
(2) Weevils
(3) Moth larvae
(4) Ants
(5) Cockroaches
(6) Mites
(7) Silverfish and firebrats

Infestations of beetles, weevils, and moths in food production and food storage areas are difficult to prevent. The initial control measure is to inspect all packages of food for insects immediately upon purchase; if infested, they should be returned to the supplier. Infestation may take place in the processing plant, transportation facilities, wholesale or retail establishments, or the institution itself. The possibility of "clean" products becoming infested in the hospital will be greatly reduced if the following measures are taken:

(1) Keep food storage and food production areas clean—floors, shelves, light fixtures, and equipment.

(2) Rotate products. Use oldest products on the shelves first.

(3) Store all food in tight containers whenever possible.

(4) Inspect all areas frequently using adequate light.

(5) Destroy or decontaminate any infested product.

Structural Pest Control

In older hospitals with wood joist construction, termites, powder-post beetles, and other pests may infest structural parts. Since structural pest control is usually outside the competency of most public health personnel and sanitation consultants, it is suggested that inspection and control activities be carried out by commercial firms. A long-term contract for such inspection and control services is often advantageous in both sanitary and economic aspects.

Rats and Mice

Rats and mice may come into inadequately protected hospital structures when: (1) rodent population pressures cause some to seek new homes and feeding areas, (2) old homes have been destroyed, and (3) the winter season is approaching. Mice often come into buildings with sacks of potatoes, onions, crates of apples, lettuce, and other produce. They may be kept out by many of the same measures outlined for the exclusion of certain insects:

(1) Inspect incoming supplies.

(2) Seal all cracks and crevices in basement walls and around basement and ground floor windows and doors.

(3) Seal any openings around service pipes and conduits.

(4) Make sure all basement and ground floor doors and windows fit tightly and present no effective gnawing edge.

(5) Apply rat stoppage measures to doors, windows, vents (basement, crawl space, and roof) using hardware cloth, galvanized sheet metal, kick plates, and other materials.

(6) Maintain good outside and inside refuse storage practices.

(7) Maintain neat and orderly grounds.

(8) Encourage and support community action if rodent infestation is widespread. (See figure 13.)

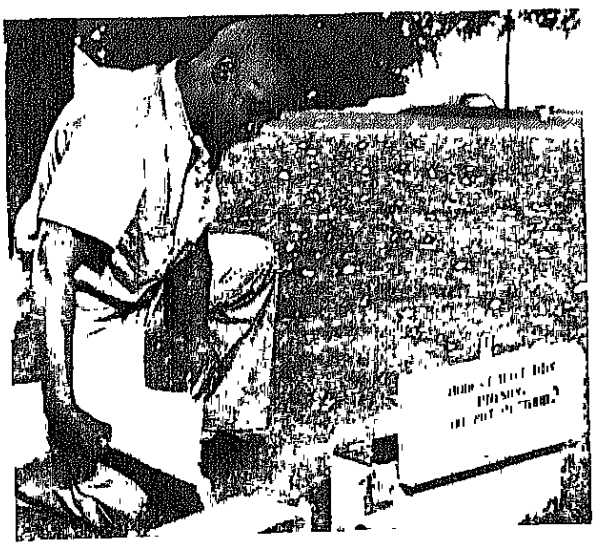

Figure 13. **Making up rodent baits for exterior placement.**

CHEMICAL CONTROL

Chemicals should not be relied upon as the prime method of control for either insects or rodents. A high level of basic sanitation must be the first line of defense. Chemical control should supplement, never supplant, environmental control through source reduction.

For smaller hospitals, it is suggested that the services of the local health department or a reputable pest control firm be employed. In the latter case, the firm, preferably, should be one familiar with hospital problems, or at least with the willingness to understand some of the situations peculiar to the hospital which might require judicious modification of otherwise acceptable procedures, techniques, and materials. Where the hospital is large enough to employ personnel having competency in this area, satisfactory chemical control can be achieved more economically.

For the hospital that carries out chemical control with its own trained personnel, the following general suggestions are offered:

(1) Have personnel work in pairs.

(2) Keep bystanders away.

(3) Adjust the control activities to the needs of the individual hospital staff and its patterns, even though this may require that a considerable portion of the work be done at normally "off" hours or at night.

(4) Keep chemicals and equipment under constant locked control.

(5) Require regular maintenance and careful use of equipment. (See figure 14.)

Comprehensive coverage of equipment, chemicals, and methods of application is beyond the scope of this discussion. However, some generally accepted chemicals, with a brief description of method of application, are listed in table IV opposite the names of the pests most likely to require chemical control as an emergency or routine procedure.

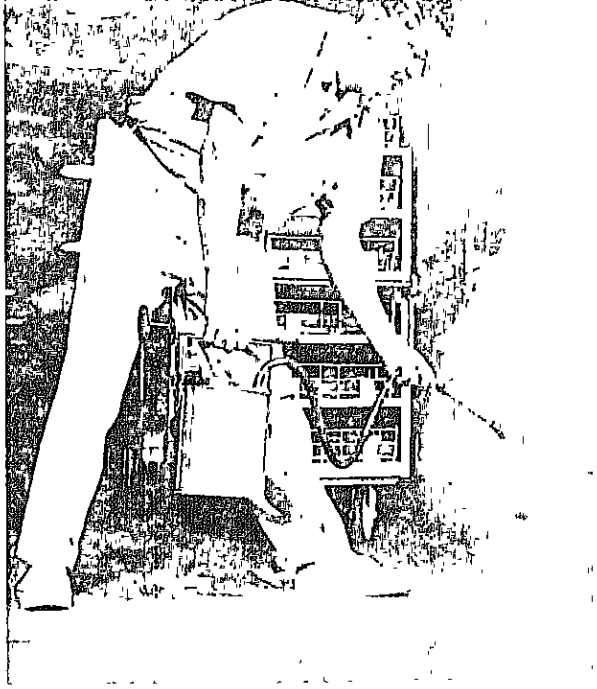

Figure 14. **Pin-stream spraying of insecticide in kitchen. Only licensed or specially trained personnel should ever be entrusted with the application of toxic products in any hospital area. The utensil cart in rear has been replaced near wall base after completion of spraying.**

More extensive coverage will be found in Additional Reading, at the close of this chapter.

It is *never* necessary to use insecticidal vaporizers in any part of a hospital. Use of these devices is *not* recommended. *All control chemicals are toxic and should be used only under carefully controlled conditions by competent personnel.* The "safest" chemical in the lowest possible concentration that will still do the job is always the chemical of choice.

Table IV. **Chemicals and Methods of Application to Control Certain Pests**

PEST	CHEMICALS AND METHODS OF APPLICATION
Flies	Residual spray outdoors where flies congregate, with 5 percent malathion—12½ percent sugar.
Cockroaches	Residual spray for all resting places (harborage) with 2.5 percent chlordane, 1 percent lindane, 2 percent malathion or 0.5 percent diazinon emulsion. Use pin-stream spray directed into cracks and crevices in walls, baseboards, furniture, fixtures, cabinets, and other places where cockroaches hide. For items which spray might damage, and in dead spaces, the operator should dust or blow 5 percent chlordane dust, 3 percent malathion dust, or finely powdered silica gel. Chlordane coverage should *not* be in excess of the equivalent of 10 percent of the total floor area of any room, and should not be applied in rooms occupied by the same person longer than 8 hours.
Lice	Dust infested areas of individuals with 10 percent DDT or 1 percent lindane. If dust is inappropriate, use 12 percent benzoate shampoo or proprietary lindane ointment. Repeat treatment in 7 days to destroy late-hatching lice. *Find and treat all contacts.*
Bed Bugs	Spray infested areas with 5 percent DDT emulsion, giving special attention to cracks and crevices in and near beds, and to upholstered furniture. Thorough application is important. One percent lindane may be used when bed bugs are DDT-resistant.

Table IV Cont'd. **Chemicals and Methods of Application to Control Certain Pests**

PEST	CHEMICALS AND METHODS OF APPLICATION
Stored Product Insects	Many are susceptible to DDT In storage rooms apply a 2 5 percent DDT suspension to floors, pillars, walls, beams, pallets, and other surfaces adjacent to susceptible stored products. Suspensions are recommended because they are nonflammable, noncorrosive, and comparatively odorless. They should never be applied if there is a substantial likelihood of contaminating foodstuffs.
Silverfish and Firebrats	Can be controlled by commercially prepared sprays or dusts that contain DDT, chlordane, malathion, lindane, dieldrin, heptachlor, or by using a sodium fluoride or barium carbonate bait. Control with bait is slower and less satisfactory than control with dust or spray
Rats and Mice	Rodenticides containing anticoagulants are most commonly used They are considerably slower acting than the single dose chemicals such as red squill but are effective. Some on the market are warfarin, fumarin, pival, PMP, and diphacin One part of 0 5 percent concentrate is mixed with 19 parts of cornmeal. The finished bait is left exposed in selected locations for 5 to 14 days. (Under certain conditions it may be more desirable to eliminate rats and mice by trapping, using the small wood-base snap trap for mice, and the large size for rats. Rats may also be trapped in steel traps, box traps, and other devices.)

ADDITIONAL READING

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PHS Pub. No.

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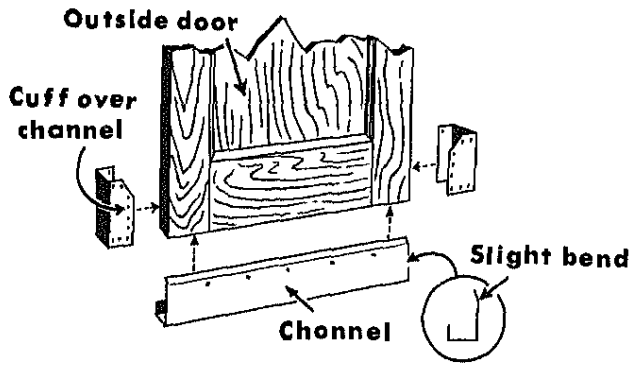
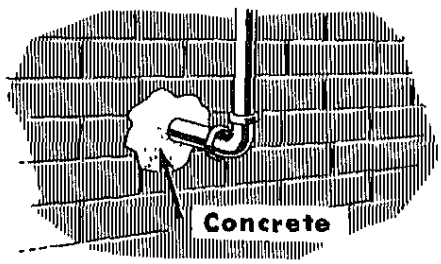
772 Part XII *Household and Stored-Food Insects of Public Health Importance and Their Control*, 1963.

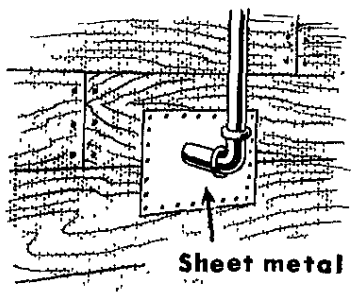
Appendix B

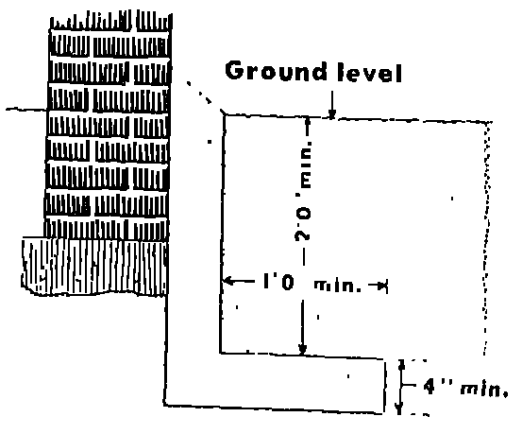
RODENT AND TERMITE PROOFING

RODENT PROOFING

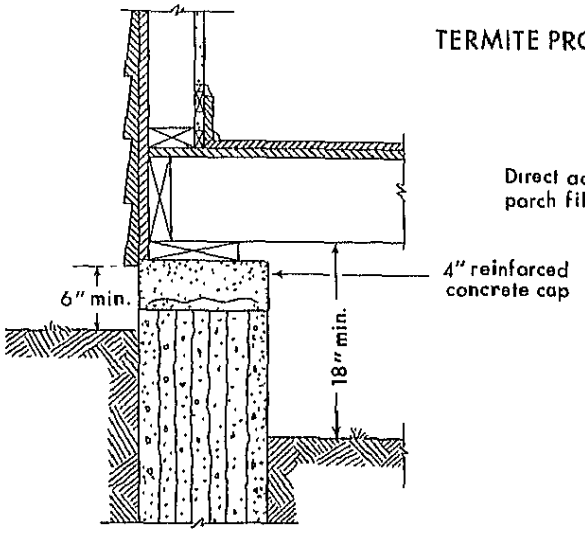




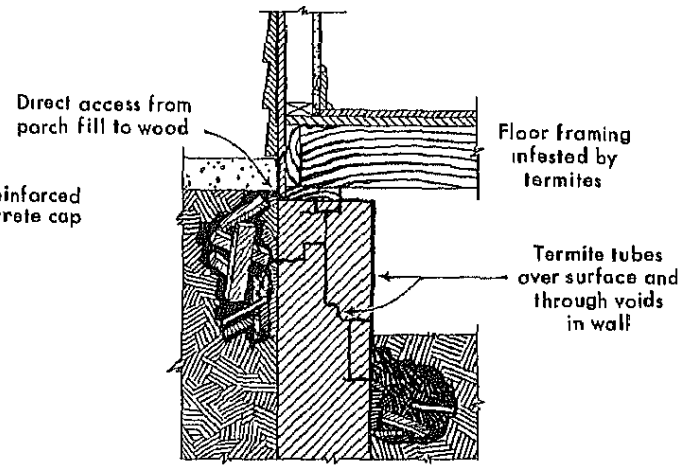




TERMITE PROOFING



PROPERLY CONSTRUCTED FOUNDATION


Direct access from porch fill to wood
Floor framing infested by termites
Termite tubes over surface and through voids in wall

IMPROPERLY CONSTRUCTED FOUNDATION

Chapter IV

DIETARY SERVICES

Lee D. Stauffer
and Winston M. Decker

PLANNING AND DESIGN

Food service in any medical care facility is a most important factor in deciding a patient's impression of the care received. Its effect on visitors cannot be overlooked, and its influence on staff morale is enormous. An insanitary food service can play a highly significant role in disease transmission, maintenance of sanitation standards is of paramount importance in medical care facilities.

The success of the food service program depends upon an effective combination of facilities, equipment and operational practices. Good sanitation, easy maintenance, and economical operation should be built in during the planning and design stages by the architect, engineer, administrator, and dietary service chief. The assistance of the nursing staff should be enlisted in selecting equipment for any nourishment facilities on patient floors. It is pointless to expect every architect to have an appreciation of food service planning needs, or for an engineer, sanitarian, or equipment consultant to know what the chief of dietary services, administrator, or chief nurse may have in mind for a particular facility. A facility that is well lighted, well ventilated, with equipment efficiently arranged, and with delivery and storage areas located close to preparation areas, is more economical and sanitary to operate, and can be maintained efficiently with less time and effort. Only by a continuing joint effort, with each professional appreciating the other's problems and needs, can the common objective be attained.

Recognized minimum standards for equipment are readily available to aid the planning team. The Public Health Service's recommendations for the design, construction, and installation of food service equipment and utensils are contained in the 1962 *Food Service Sanitation Manual,* Public Health Service Publication No. 934.

In addition, the Public Health Service cooperates with such organizations as the National Sanitation Foundation, the Committee for 3-A Sanitary Standards, the Baking Industry Sanitation Standards Committee, and the Automatic Merchandising Health Industry Council in developing adequate sanitary standards for design and construction of food service equipment.

In view of the various types of food service, menus, and individual establishment needs, it is impractical to establish categorical space allowances to fit all situations. Cubic footage for storage and refrigeration, linear footage for aisle width, spacing between fixed equipment to permit adequate cleaning and maintenance, and dimensions of work surfaces and counters to encourage the most efficient use of employees all reflect highly individualistic needs. Numerous recommendations are available to dietitians, design consultants, and engineers, such as those set forth in National Sanitation Foundation recommendations for equipment installation.

When planning, the use of portable equipment should be considered whenever possible to promote ease of cleaning and prevention of insect harborage. Where portable equipment cannot be utilized, equipment should be sealed to floors, walls, and other units. Equipment should conform to current Public Health Service standards as to materials, design, and construction, and meet operational

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criteria for temperature maintenance in hot or cold food-holding equipment. Mechanical dishwashing equipment and its auxiliary equipment such as dish tables, racks, and prefush and disposer equipment, must be given special attention for efficient layout in the dishroom.

A separate and adequate ventilation system for the food production area, including the dishroom, which draws air from and discharges to the outside atmosphere, is a design fundamental. If feasible, air conditioning should be provided, using the same comfort and efficiency criteria that apply to similar hot work areas, such as the laundry.

The need for good lighting deserves particular attention in food production areas and dishrooms. Improved visual performance aids food service practices, improves work safety, and makes sanitation and maintenance much easier. Wall and ceiling surfaces should be flat-finished in light colors with a high reflectance value. More than the current minimum standard of 30 footcandles of light should be provided on all working surfaces for optimum operation.

The soundproofing of food service areas is of particular importance. Proper location of particularly noisy areas, such as the dishroom, away from dining or patient areas, is far more effective in noise reduction than attempting control by acoustical surfacing. Unfortunately, the dishroom is often placed immediately adjacent to serving or dining areas to expedite utensil sanitizing. The following measures to reduce noise in the dietary facility, including dishwashing operations, may be useful:[1]

1. Refrigerators should be specified for quiet operation; sealed compressor units are preferred.

2. Refrigerator motors and compressors should be mounted on a common base provided with vibration isolators.

3. The compressor unit, as with reciprocating compressors, may be placed in a double-walled box with sound-isolating ducts.

4. Ice machines, if located near patient areas, should be selected for quiet operation and should be fully enclosed. If ventilation is required, a small ducted blower should be used rather than louvered doors.

5. Dishwasher noise may be minimized by regulating steam pressure, sealing cabinets, damping sheet-metal, and by using vibration isolators.

6. Metal sinks or basins should be damped with an undercoating material.

7. Metal sinks and cabinetry should be treated with a damping compound to reduce sound; the use of laminated construction is suggested.

When a facility is remodeled, consideration must be given not only to adding equipment or rearranging it to promote more effective workflow, but also to accomplishing the job without drastically interrupting meal preparation and serving during the remodeling period. Maintaining production will involve careful planning so that equipment may be moved and installed during nonproductive hours, with proper time allowance given to installation, replacement, or removal of partitions; repairing floors; changing lighting and ventilation systems; and, where possible, moving entire service areas as single units between one day's operation and the next.

OPERATIONAL CONSIDERATIONS

Sanitary controls in food service begin with food selection and purchasing. The initial requirement is that all food come from sources approved by the health authority having jurisdiction and be of good sanitary quality when delivered. Home-canned foods should not be used because they have frequently been the cause of foodborne illness. Cooking milk, when purchased in bulk, should be dispensed from a refrigerated bulk milk dispenser approved by the health authority. Large containers of milk never should be left unrefrigerated, nor should smaller portions be dipped from them for use in other preparation areas. Many dessert and special diet items, when made from unrefrigerated bulk supplies, have resulted in foodborne outbreaks that played havoc among already debilitated patients.

Fruits and vegetables may have insecticide residues on rinds or leaves, and must be carefully and thoroughly washed to prevent any possible carryover of toxic compounds to the patient. Broken seals or packages, swelled cans, and abnormal appearance or odor all constitute danger signals that should be heeded by the dietary service staff. There is no more appropriate area than the medical care food service in which to practice the old admonition: "If in doubt, throw it out!"

After food has been purchased, good storage, although basically dependent on good planning and design, must be maintained by sound operational practice. No overhead sewer lines should run above food storage, preparation, or serving areas. Storage should be above building grade whenever possible.

No floor drains should be permitted that make contamination by sewerage backflow a possibility. Food should be stored sufficiently above floor level to allow easy cleaning of floors and corners and to protect against contamination by both the cleaning process itself and accidental flooding from any source. All openings to the outside should be rodent- and insect-proofed by screening, tight closure on all doors and windows, and tight metal flashing around all pipes and ducts passing through walls, floors, and ceilings of storage rooms or areas. (See figure 15.)

Keeping potentially hazardous foods at safe holding temperatures constitutes one of the most important safeguards in the entire food service cycle. Maintaining these foods at temperatures of less than 45° F or more than 140° F. is a fundamental requirement in any food operation. This requires extreme care in:

1. *Reheating foods.* This practice should be held to a minimum by good planning so that the use of leftovers is rare. If reheated, such items as gravies, sauces, and other high protein foods should be brought to over 140° F. internal temperature. Merely warming such foods on a steam table promotes incubation of pathogenic organisms that may be present.

2. *Thawing frozen foods.* For example, permitting frozen poultry to thaw at room temperature allows several hours at incubation temperatures for the outer portions of meat before the inner parts have thawed. Thawing in the refrigerator after removing from the freezer, or thawing in potable running water at a temperature of 70° F. or below, is satisfactory from the health standpoint, as is the quick-thawing that occurs as part of the cooking process.

3. *Storing foods.* Potentially hazardous food should be stored in refrigerators in flat shallow pans or in small containers to decrease the cooling time and reduce the possibility of the multiplication of pathogens.

4. *Preparing foods that will not be cooked.* Mix salads with ingredients that have been previously refrigerated whenever possible. For example, there is a dramatic reduction in cooling time when potato salad is made with potatoes that have been boiled, cooled, peeled, diced, and refrigerated before mixing with salad dressing and other ingredients, and then returned to refrigeration until serving. Any items involving uncooked eggs are especially hazardous.

Basic preparation practices also require the closest continual supervision. Grinder heads, tenderizer blades, and other demountable working parts of equipment are sometimes put into the refrigerator instead of being cleaned daily. All working surfaces, utensils, and equipment must be thoroughly cleaned and sanitized after each use. Separate cutting boards should be provided for red meats, poultry, and salads, and prepared foods should not be cut on the same boards used for raw food preparation. Poultry is most hazardous; merely sanitizing the work surface used for poultry before using it for dicing meats or, particularly, salads or other dishes which will not be cooked, invites cross-contamination with disease organisms.

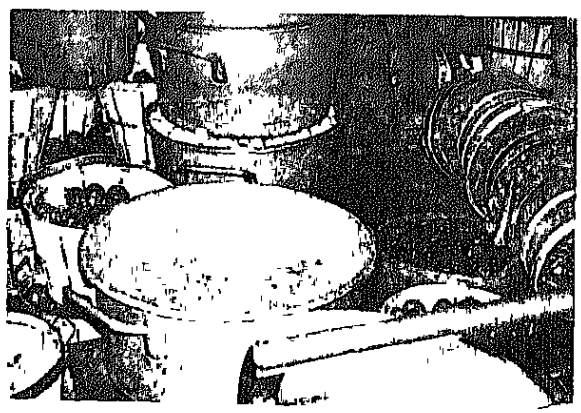

Figure 15. **Overloaded refrigerators may result from inadequate-sized facilities or carelessness. Such practices can cause contamination from container bottoms in contact with washed or peeled food or from loose soil falling from delivery containers into already cooked or prepared food.**

Mechanical Dishwashing

Mechanical dishwashing is one of the most common areas of operational difficulty. The modern mechanical dishwasher is sturdy and, if properly operated and maintained, an efficient piece of machinery. Prompt handling of dirty utensils before food scraps harden, preflushing in warm water, proper racking, and the maintenance of an adequate detergent concentration in the wash tank are important operational factors, along with proper exposure times, water volumes, and temperatures.

The machine should be drained and flushed daily and all wash arms should be demounted, thoroughly flushed, and checked to see that the spray jets are not plugged. Scrapping trays should be cleaned

and the tank drain checked for any obstructions, such as broken glass, utensils, or paper waste. The pumps should be inspected regularly for leakage so they can be repacked as necessary, thus eliminating pressure losses and water waste. Flow pressure and temperature of the wash water, pumped rinse, and final rinse water should be checked with easily observed, accurate gauges and thermometers. Flatware should be racked in perforated canisters, food contact end up, or placed no more than one layer deep on a standard wire rack. The use of rinse compounds to help drying of the dishes is helpful but not essential if the conveyor cycles are properly timed, the wash and rinse water temperatures and volumes correct, and the dishroom adequately ventilated. Additional equipment specifications and operating guides can be found in *Food Service Sanitation Manual*, Public Health Service Publication No. 934, and Standards 3 and 5, National Sanitation Foundation.

Adequate separation of clean and dirty dishroom operations is discussed in Chapter IV, of Volume I, *Environmental Aspects of the Hospital: Infection Control*. Physical separation of clean and dirty ends of a dishmachine has been suggested. This would reduce the clean-dish recontamination hazard from garbage-grinder aerosols, and somewhat reduce the hazard of dishroom personnel going directly from scraping and racking to removing clean ware. Most hospitals have no such physical barrier, and the most practical answer today seems to be thorough handwashing before personnel move from handling dirty to clean utensils. As in so many other problems of the hospital, alert and conscientious supervision is the key to the problem. Where personnel normally perform only one operation—"clean" or "dirty," as in a flight-type machine operation—the danger of recontamination may appear less. In practice, however, an absent employee or an especially heavy workload can disrupt any normal separation of duties. Training in the need for handwashing, and the supervision to assure its practice, is indispensable.

Ice Handling

Mishandling of ice is one of the most frequent violations observed in any food-handling operation. The widespread negligence in cleaning ice-making machines, the casual use of the ice storage compartment for cooling soft drinks and wrapped sandwiches, the "bare hand" method of filling ice packs or replenishing carafes, and the storing of ice scoops on surfaces that are infrequently if ever cleaned give ample testimony that ice is not handled as carefully as other materials which the patient will ingest. This almost universal lack of awareness, at least in practice, that ice melts to become part of the liquid which it cools, exposes the patient to an unnecessary risk. As in many other areas of the hospital environment, there are no dramatic statistics indicating how many cases of disease have been transmitted by contaminated ice. This must not alter the fact that the environmental control process is a total one. The mishandling of ice or food is a fundamental error that endangers the patient, just as are violations of aseptic techniques by surgical team members, or failure of pediatric nurses to wash their hands after caring for each infant.

Water Carafes

The protection of water carafes is a frequently neglected control procedure despite ample evidence that they are often insanitary, reused, and misused. Many hospitals still use a replenishment system instead of a replacement system. Sanitized carafes—obviously requiring a design which can be effectively sanitized—should be freshly filled with properly dispensed ice and water, and placed at the patient's bedside daily, or at shorter intervals as required. The used contaminated carafes should be collected and returned to the kitchen to be sanitized before the next use. Carafes should never be flushed out in the wash basin of the patient's toilet room and then returned to service. A commonly observed hazard occurs when visitors drink part of a cup of water from the bedside carafe and pour the remainder back into the carafe. Such a practice can hardly be viewed as contributing to the total safety of the patient's environment.

Personal Hygiene

Food workers' personal cleanliness is another major factor in sanitary food preparation. Frequent handwashing, always after toilet use or after a smoking break, and as often as necessary while working, will add an irreplaceable safety factor. Health agency standards consistently point out that food workers should only be allowed to work when they are not suffering from disease. However, under practical conditions both workers and manage-

ment are reluctant to bar a worker from duty except under the most extreme circumstances. Current personnel practices tend to reward employees who are faithful in attendance. One factor usually taken into account when a worker is considered for pay raises or promotion is his ability to stay on the job. In many instances there are no provisions for paid sick leave above a very brief time span. Consequently, the barring of food workers from duty for what are often classified as minor illnesses—upper respiratory infections, diarrhea, or minor cuts and wounds—is much more theoretical than actual. These minor illnesses, however, are potentially very serious for patients if the causative organisms are transmitted to them from the infected worker.

When a case of gastrointestinal disease appears, it usually indicates that the sufferer has somehow ingested fecal material of either human or animal origin. If all food workers washed their hands thoroughly and frequently, with special emphasis on handwashing following toilet use, the incidence of foodborne infection and intoxication would be tremendously reduced. The only method of accomplishing this among people whose personal habits are sometimes deficient in this respect is through good training and constant supervision by supervisory personnel who have both the authority and the willingness to correct these mistakes in their subordinates. Adequate facilities such as handwashing fixtures and toilet and locker rooms must be provided by the institution. Location is extremely significant. If handwashing facilities are not located conveniently in the work areas, the workers will not bother to use them.

SUPERVISORY RESPONSIBILITY

No changes in procedures or materials used in the dietary facilities should be undertaken or approved by anyone other than the department head. The wide choice of cleaning materials and the many new and virtually untested products coming on the market every day make it impossible for the worker to be familiar with their properties.

Food service workers cannot normally be expected to know what chemical compounds can be harmful and, consequently, should never be permitted, on their own initiative, to substitute materials or to alter the procedures under which they are used.

Basically, the dietitian is responsible for insuring that required practices and precautions are included in inservice training, and that the workers truly comprehend and follow them. Although physical examinations at the time of employment carry no guarantee of the worker's health on the following day and, consequently, are not required in many jurisdictions, the food service worker returning from an illness should be examined and cleared by a physician before returning to the job. Employees must be made aware of the significance of their own health as it affects the well-being of patients and staff. This awareness is created by training the work force receives from dietary supervisory personnel.

Training

One of the most important and continuing supervisory responsibilities is to carry out an adequate inservice training program. This should be done on a periodic basis and is usually best accomplished by a combination of demonstrations, lectures, and visual aids. Convincing the average worker of the necessity of maintaining good sanitation practices is not an easy task and cannot be done once on an orientation basis and then neglected. Some basic points to be emphasized to workers follow:

1. The necessity for personal cleanliness: daily bath; clean clothes; clean hair, covered with an effective hair restraint while on duty; clean hands and fingernails; frequent handwashing, always after toilet use and as often as necessary while working
2. The necessity to report illness, sores, or cuts promptly. Food should not be handled by employees who have infected cuts, pimples, or other infections
3. How to clean properly all utensils and equipment used in preparing, storing, or serving food
4. How to inspect food when delivered
5. How to wash fruits and vegetables
6. How to prepare food with clean utensils instead of with the fingers: making certain that utensils used for tasting are not replaced in food being prepared or served; picking up utensils by handles, not by food contact surfaces; picking up cups by handles and glasses by base, not drinking surfaces.

Employee training for new and veteran employees can be formulated along the following guidelines:

1. Determine, according to work area, what you want done, and how. Maintain a current, written

lule of the duties involved in each job and the oximate time necessary for completion. Intro- the new worker to his co-workers. Make him that he has a definite contribution to make to fficient operation of the department.

Explain duties carefully and stress the im- nce of cooperation.

Instruct in sanitary methods of food service.

Show how to do the job the best way (use of nment, short-cuts with materials and tools).

Teach the use of and reason for safety devices.

Explain regulations (hospital and depart- tal) that affect the employee. Keep him med of changes in policy

Check the employee's progress. Do not ex- too much too soon, but insist on the correct edure.

In the smaller institution, individual on-the-job instruction will probably constitute the larger part of any training, while group sessions usually are more practical in larger facilities with larger staffs It is essential that the supervisor practice what he preaches and that set policy be uniformly and diligently enforced.

Safety

Safety considerations should be an integral part of the ongoing training program (See figures 16, 17, and 18.) A good list of safety considerations relative to dietary services is in the American Hospital Association *Hospital Food Service Manual.*[2] Some basic guidelines follow:

Hazard	*Preventive Measures*
	Instruct all employees in the location and use of fire extinguishers and the fire-reporting systems; to keep filters and hoods over stoves and other cooking equipment clean and free from accumulated grease; to keep salt in a convenient place for prompt extinguishing of top-stove or oven fires; not to leave greasy pans in the oven, not to render fat in the oven; not to let grease accumulate in broiler drip pans.
etrical shock or burn	Warn employees against the handling of electrical equipment with wet hands.
ury by mechanical equipment	Instruct employees in the correct use of safety devices on all equipment, and to report defective equipment promptly.
:k strain; injury by heavy ing	Instruct employees how to lift heavy loads or equipment with a minimum of effort and strain.
ury by slipping on wet floors	Teach employees to walk carefully on wet floors; to wipe up immediately any food spilled on floor.
ts from knives or other sharp chen tools	Teach employees to keep knives sharp (dull ones are far more dangerous); to use the right knife for the job; to cut away from the body; to avoid "palming" vegetables or fruit when paring or slicing; not to use knives to open jars, cans, or other containers; to keep knives in holder or racks when not in use—a sharp-edged tool left lying around is likely to be covered up and cause a cut later.

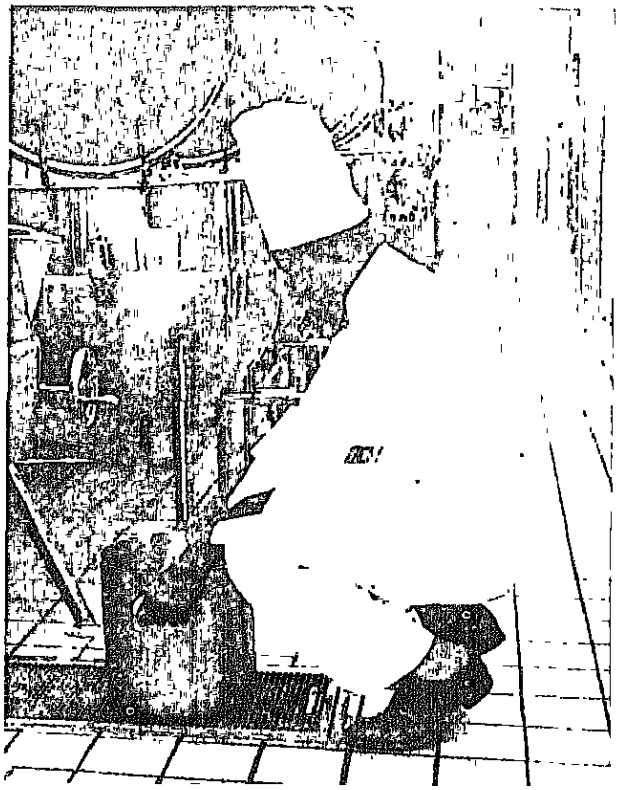

Figure 16. **Heavy loads should be lifted with "leg-pawer," keeping the back straight.**

Figure 17. **Ranges should be opened and the match introduced only after any accumulated gas from possible leaks has been diluted enough to prevent an explosion.**

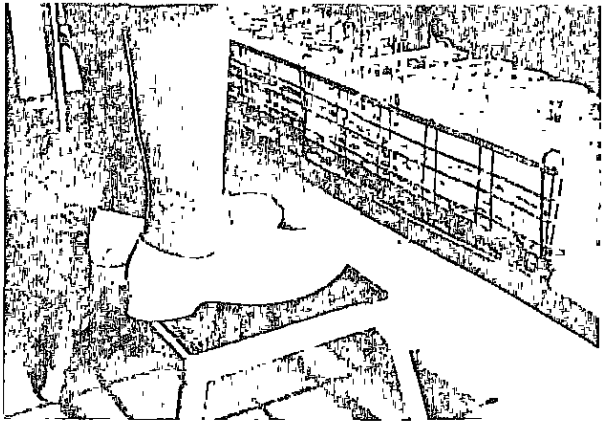

Figure 18. **Reaching high shelves or cleaning overhead equipment should be done while standing on sturdy, nonskid support.**

In establishing any safety program it is always necessary to remember that any accident has two general components: (1) the environmental factor, and (2) the human factor. The environmental factors usually can be eliminated or controlled; the human factors are much more difficult to control or even to measure. Obviously, the most profitable approach is to eliminate the environmental factors which may lead to accidents, while concurrently training individuals to recognize and take necessary precautions against those factors that cannot be changed.

INFANT FORMULA FACILITIES AND PROCEDURES

Receiving-Washing Room

An area should be provided for receiving bottles, caps, nipples, racks, and containers returned from nurseries. It also may be used for rinsing and washing nipples, caps, and bottle racks before moving them to the formula preparation room.

Formula Preparation and Terminal Heating Room

The formula preparation room must be kept scrupulously clean. All equipment for preparation and processing of formulas should be of sanitary design and constructed to permit easy disassembly and cleaning. Equipment should be made of nontoxic, smooth metal, or other impervious material that will not in any way cause contamination of formulas.

There should be adequate handwashing facilities in the room—at least one sink with an adequate supply of hot and cold water. Faucet controls should be foot- or knee-operated. Only equipment and supplies necessary for preparation, bottling, and sterilization of milk formulas should be permitted in this room. Moreover, there should be no direct openings to the outside atmosphere from the formula preparation room.

An adequate air supply system, equipped to remove particulates in a manner approved by the health authority having jurisdiction, should be provided. A positive pressure differential should be maintained in this room to assure an outward flow of air from the formula preparation and terminal heating room to all adjoining areas.

All sterilizers should be equipped with recording and indicating thermometers, properly installed and maintained. Thermometers should be accurate within one degree Fahrenheit.

Employees Dressing Rooms

An adequate number of lockers and toilets should be provided, easily accessible to the formula processing area. Handwashing sinks with hot and cold running water, soap dispenser, disposable towels, and a used-towel container should be provided in each dressing room.

Suggested Operating Procedures

Supplies

1. All supplies used in the preparation of formulas should be stored in the original containers in the formula preparation room and be properly labeled.

2. Products such as evaporated milk, modified milk, and other products necessary for the preparation of formulas should be obtained from sources approved by the local health authority.

3. Any open containers or any readily perishable formula ingredients that remain at the end of the day should be discarded. All other materials such as partially used dry products in their original containers may be kept, provided the containers are covered tightly with their original lids to prevent contamination or spillage. Such materials also may be sealed in single service plastic bags.

4. Empty cans and containers should be placed in a covered trash receptable as contents are used in formula preparation.

Washing and Sterilizing Bottles, Caps, Nipples, and Utensils

1. All soiled equipment should be returned to the receiving-washing room and placed in storage containers until washed.

2. Caps, nipples, and bottle rings should be thoroughly washed in an approved detergent solution and thoroughly rinsed in clean water.

3. Cleaned nipples should be emptied into stainless steel containers and the containers placed in an autoclave for sterilization. This equipment should be steam sterilized for at least 10 minutes at 230°F.

4. Bottle racks should be washed and sanitized before being brought into the formula preparation room.

5. Utensils and all other equipment relating to the preparation of formulas should be washed in hot water containing an approved detergent, rinsed in clean hot water, sanitized, and then stored to protect them from contamination. Immediately before use, this equipment should again be sanitized by a method approved by the health authority having jurisdiction.

6. Equipment too large to be sterilized by pressure steam sterilization should be sanitized in a manner approved by the health authority having jurisdiction.

Formula Preparation and Terminal Heating Procedures

1. Only personnel preparing and processing formulas should be in the preparation area or terminal heating room during normal operations. Sterile caps, gowns, and approved shoes or sanitary shoe covers should be worn by all personnel and changed daily, or more frequently if necessary.

2. Personnel filling bottles and sterilizing formulas should scrub their hands and arms vigorously with a brush for 3 minutes with an antiseptic soap prior to entering this area, and should don freshly laundered gowns, caps, and sanitary shoe covers. Personnel leaving the area and returning should change gowns and caps and rescrub before reentering.

3. Jewelry such as rings, wristwatches, and earrings should not be worn in the formula preparation and terminal heating room.

4. Detergents, cleaning materials, boric acid, and other toxic or potentially harmful materials must not be kept in the formula preparation and terminal heating room.

5. All work surfaces should be thoroughly

washed with an approved detergent and rinsed with an approved sanitizer immediately before the preparation of formulas.

6. All materials used in formula preparation should be kept in the original container, properly labeled, and be obtained daily from the food ingredients storage room.

7. Personnel preparing formulas should use clean techniques, as specified by the formula room supervisor.

8. Only utensils and equipment used in the preparation of formulas should be kept in the formula preparation and sterilization room.

9. As rapidly as possible after sterile bottles have been filled with formula, rings, nipples, and caps should be placed on bottles.

10. Each rack of infant formula should be labeled with the formula ingredients, name of person ordering formula, date prepared and by whom.

11. The formula should be stored at a temperature below 40° F. at all times.

12. Filled and capped bottles should be transported to the sterilizers in racks of approved design.

13. All formulas should be terminally heated under steam pressure to assure that the contents of each bottle will be held at 230° F. for 10 minutes. Such heat treatment should be begun within one hour after preparation of the formula is completed.

14. Steam sterilizers in which formulas are terminally sterilized should be equipped with a separate recording and indicating thermometer, and all charts of the recording temperature should be signed by the formula room supervisor and kept on file for a period of 6 months.

Supervision of Infant Formula Preparation

Infant formula preparation operations should be continuously supervised by a qualified dietitian or registered nurse. The supervisor should have specialized training in formula preparation and terminal heat treatment procedures and must be particularly knowledgeable regarding the requirements and practice of infant feeding. The supervisor is responsible for training all formula preparation personnel and for directing all formula room operations.

Microbiological and Chemical Control

A specific plan of surveillance should be established to provide for frequent sampling of finished ready-to-use formulas and submitting these samples to the hospital laboratory or other qualified laboratory for microbiological and chemical evaluation. All formulas should be sampled at least twice each week for microbiological examination as follows: Plate counts using methods specified in *Standard Methods for the Examination of Dairy Products*, Eleventh Edition, published by the American Public Health Association should not exceed 25 colonies per milliliter. Individual colonies should be identified. If organisms other than spore formers are found, techniques of formula preparation and terminal heat treatment should be carefully examined and defects immediately corrected.

All formulas should be examined at a predetermined frequency for chemical composition. Such examinations should include determination of total sodium, potassium, chlorides and nitrogen, as well as the pH of the formula.

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Chapter V

LAUNDRY SERVICES

Herbert M. Gaskill

RELIABLE LAUNDRY SERVICE in the hospital has always been a necessity to help maintain a clean environment and for its esthetic significance to the patient. Clean linen is a vital element in providing high quality medical care. The patient in today's medical care facility expects daily linen changes—more frequently if necessary. This rigorous schedule is very demanding on the ability of fabrics to withstand the repeated cycles of use and laundering within short periods of time. Sufficient quantities of each item should be on hand to provide a rest period in storage that will minimize the wear and replacement resulting from constant use.

SYSTEMS OF OPERATION

Advantages of the hospital doing its own laundry compared to a contract laundry operation have been debated at length. The problem requires careful study because most advantages and disadvantages apply for either system, depending on the competence of the personnel responsible.

A third possibility is the use of cooperative laundries, where several hospitals use an enlarged facility in one hospital or a commercial operation devoted exclusively to doing the cooperating hospitals' work. Such an arrangement has potential financial advantages. In Great Britain this method, although government-operated, constitutes the predominant pattern. The one substantial disadvantage has been geographical, since the participating hospitals must lie within a range that permits re-
-distribution. Several co-
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-tsburgh,
or a decentralized
- matter for the hospital to decide. Since both methods can be made to work, the decision should be based on the best service with the least overall cost

LOCATION

Every time a piece or load of linen is handled, the cost of laundry service increases. Physical plant layout is vitally important in controlling cost. By keeping traffic flow lines as short as possible on vertical or horizontal transportation between the laundry and the areas of use, efficient operation can be realized. This is most easily accomplished in a stacked building, all services being in the subbasement, with the laundry near the elevators and the soiled linen chute emptying into the receiving room of the laundry complex. The steam supply should be delivered with as short runs as possible to minimize line losses and provide ample heat to the flatwork ironers and presses.

In hospitals comprised of a number of buildings covering many acres, with scattered complexes of nursing areas, controlling handling costs becomes more difficult. Linen traffic flow must be studied so that "dead head" trips are kept to a minimum, since it costs as much to move an empty cart as to move a full one designated for either clean or soiled linen. When the laundry is housed in a separate building, it should be located as nearly downwind from the hospital as possible so that heat and odors will not be drawn into hospital air intakes. If the laundry is to serve several buildings, a central location will keep the lines of transportation short.

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In larger hospital complexes, the installation of a separate laundry in the maternity and nursery areas is advantageous. Tunnels or covered above-grade passageways between the various buildings, if built of ample size, allow the use of powered trucks for handling linen, as well as food and supplies. Hospitals planned for areas that have considerable snowfall should investigate these possibilities.

SEPARATION OF AREAS

Soiled linen, if not sorted at the bedside, can be sorted in the laundry receiving room or after washing. In larger hospitals, the receiving room is best located on the floor above the wash room so that linens, after being sorted and batched, can be chuted to the washers below. The receiving room should be under fan-induced negative pressure to prevent any airborne organisms from reentering the corridor or the clean areas of the laundry. In smaller institutions, the receiving room is usually located on the same level as the wash room and should be physically separated by solid partitions from the other laundry areas.

EQUIPMENT AND PLACEMENT

Where water conditions indicate the use of a water softener, the location of such equipment will be determined by whether the entire hospital supply or just the laundry water is to be treated. If the whole supply is to be treated, the softener may best be located in the boiler room under the supervision of the hospital engineer. If only the laundry supply is to be treated, the equipment may be located in the laundry building or area.

The hot water storage facility should be in as close proximity to the wash wheels as possible. The higher temperatures needed in the laundry can thus be isolated from lines serving the nursing areas, obviating the need for a recirculating loop and pump to prevent excessive line losses of temperature. All piping and fittings should be of ample size to insure rapid filling and draining of washers.

Time studies in the various processing and handling operations represent a most productive method of seeking more economical functioning of the laundry. The cost of supplies is usually less than one-tenth that of labor, power, and machine time; consequently, efforts in efficient layout and operation of a plant will not be wasted. A sheet going through the usual laundry process is handled as much as twelve times. With rising costs, laundry machines that eliminate or combine processes are being installed with increasing frequency.

Washer-extractors of the double-ended type are available; they can be mounted through the wall between the soiled linen (receiving) room and the clean laundry area. The soiled linen is loaded into the pockets of the wash wheel through doors in the head of the machine in the receiving room. The linen is removed in the main laundry room through doors in the head on the opposite end of the machine adjacent to the drying tumblers or flatwork ironer. This feature avoids unloading clean linen into a contaminated area. There are other washer-extractor machines on the market which do not lend themselves to through-wall installation but still give the additional output made possible by the combination of the two processes in one machine. Vibration problems have been virtually eliminated in current models. Models are available that rest directly on the floor with no anchor bolts, but of course adequate foundation support must be provided. Wherever possible, footings for all heavy equipment should be isolated by the installation of a two-inch anti-vibration joint between the footing and the floor. The joint is filled with a cushioning material and sealed with mastic.

The floor under the washers should have a gutter of sufficient capacity to prevent overflow when two or more washers are dumped simultaneously. Space should be provided and piping outlets installed to provide for future expansion. This is an item that can cost thousands of dollars when more equipment is added. The cost of the few fittings is insignificant when compared to the cost of shutting down the plant or paying overtime to install the extra fittings.

The drying tumblers should be placed in the flow pattern between the extractors and the door to the linen storage room, since tumbled pieces only require folding before being put on the shelves. This location will be influenced by the location of the flatwork ironer, which must be favored because of its size and complexity. The feed end of the ironer should be adjacent to the racks, and the discharge or folder end should be set so that the linen reenters the flow pattern near the door to the storage room or the laundry exit.

The presses can be fitted in wherever convenient in the remaining space. Sufficient floor space should be allotted so that wheeled racks for finished uni-

forms can be accommodated without interfering with the flow pattern through the area. A work area that requires constant shifting of trucks or racks to permit traffic flow is a constant expense. With ample work and aisle area, the laundry can grow into space rather than being cramped and incurring excess labor costs trying to make the work flow smoothly Annoyance caused by constant, unnecessary hauling of trucks to circumvent obstructions in what should be a clear path, reduces efficient production and impairs morale. Production of quality work is the prime purpose, and every effort should be expended toward that goal, not in fighting cramped quarters. Good planning can pay large dividends in increased output.

A room near the aisle of the wash room should be provided for supplies and bulk containers of detergents, soaps, and other chemicals used in washing. Scales or a set of measures should be placed there so that formula strengths can be closely controlled. A starch cooker, if used, should be installed in the wash-room area. A floor-flush mounted scale, a two-wheeled barrel truck, and several of water and CO_2 fire extinguishers should be placed in the laundry.

The use of linen oil will help reduce the lint problem. Also, if the hospital has a central vacuum system, there should be ample connections in the laundry area to help in daily lint pickup. Trash cans with tight-fitting lids should be easily available to hold collected lint that may settle on the floor and work surfaces. At the end of each workday, the lint not collected by the ventilation system traps should be swept up or vacuumed and deposited in the cans. These should be emptied the same day or removed to fireproof storage until disposal.

The laundry should be planned with no crossflow of linen as it moves among the various machines. The presses, flatwork ironer, and drying tumblers should be close to the laundry exit door. The shorter the distance to linen storage areas, the less labor involved. In some hospitals, an endless belt from finishing areas to the issuing area of the linen room has eliminated much unnecessary labor spent on loading and unloading trucks.

The linen room should be equipped with automatic sprinklers to reduce fire hazards. Sewing machines and heat patch devices should be available to dispense the "stitch in time" that holds linen replacement costs down. Smooth-topped tables must be used for sorting to avoid snagging the fabric. Ample adjustable shelving should also be available to sort the clean linen prior to issue. Shelving mounted on casters or carts should be used to permit easy daily cleaning operations.

VENTILATION AND LIGHTING

Improved working conditions are conducive to increased worker efficiency, less rejected work, and reduced labor turnover. Hospital laundries are like industrial plants in that State labor laws establish wage rates, working hours, and conditions. Hospital management should realize that dollars spent to improve the lot of the laundry worker will be repaid by a more economical long-term operation.

The heat needed in the laundry should be concentrated on the linens, not the personnel. Removing excess heat after it has done the work in a machine can greatly improve the output of the worker by making him more comfortable at his work station. The flatwork ironer is the greatest source of heat and vapor in the laundry. It should be efficiently ventilated by a glass-doored hood that overlaps the steam chests. This hood should be exhausted by a fan of the proper size, and discharged so that none of the heat or vapor can reenter the hospital. A 6-roll, 120-inch ironer should be vented at about 3,000 cfm, and other sizes proportionately.

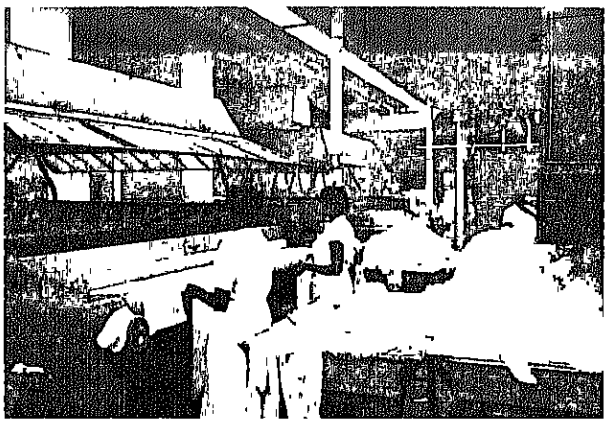

Figure 19. **Exhaust hoods over flatwork. Note also good lighting of work area.**

The air velocity across the worker should not exceed 150 fpm so that a drafty work area is not created. (See figure 19.)

The shell of the drying tumblers should be

vented through the roof into an efficient lint trap to avoid a hazardous accumulation of lint. The trap should be cleaned regularly to minimize the fire hazard. For a laundry in the hospital basement where a long stack to the roof would create a serious fire hazard, lint can be intercepted by a circulating water spray in the discharge ducts of the tumblers. The spray heads should atomize about 2½ gpm of water into each duct entering the manifold. The saturated lint falls into an inclined pan which channels the slurry into a bag or basket. The excess water is drained into a reservoir under the lint container from which it is pumped back to the spray heads. Water loss is compensated by means of a float-actuated makeup valve on a supply line properly air-gapped to protect against backsiphonage.

The area over the washers should also be vented to remove vapor and odors found in this location. Makeup air, brought in near ceiling level from intakes separated from exhaust vents, must be free of soot or other airborne particles that could soil the clean linen and should be filtered, particularly in metropolitan areas. Cooling is desirable to help reduce heat and humidity, but in northern areas some tempering of the makeup air may be necessary in winter.

Good light is necessary for workers to see their tasks clearly and to detect defective work that must be removed from the linen flow for repair, replacement, or reprocessing. For critical locations such as the feed and discharge ends of the ironer and at the presses 75 to 100 footcandles should be provided. From 15 to 25 footcandles should be provided in all trucking aisles. In the washer, dryer, and extractor areas, 35 to 50 footcandles are adequate. Some of these values may appear high to the uninitiated, but the small cost in light will measurably improve output. In many hospitals, the laundry is a large, barren room with lights near the ceiling that were originally spaced on the draftsman's board with no consideration as to the location of the machinery below. With the help of swivel adaptor sockets and reflector spot and flood lamps, the existing geometrically spaced ceiling sockets in most laundries can be used to direct the light to areas where the work demands supplemental lighting. When lighting any work area, it is usually better to use a higher value than recommended in minimum standards. A light-colored paint on the ceiling and walls, with a reflection value of 55 to 70 percent, will reflect instead of absorb the light falling on the surfaces, creating a much more pleasant area in which to work. Both luminaire and painting costs are recovered in increased laundry output.

HANDLING AND COLLECTION OF SOILED LINEN

Linen that has been used on isolation cases, suspect cases, or in the nursery should be handled with due respect for the hazards involved. Lack of proper technique can spread infection.

All dirty linen should be placed in an impervious bag and stored in the dirty utility room until trucked or chuted to the laundry receiving room. Collection should always be arranged so that soiled, and particularly moist, linen is never left overnight. The multiplication of microorganisms is greatly increased in soiled items that are moist adding an unnecessarily high bacterial load to be removed. Isolation linen should be double-identified and double-bagged, or a water-soluble plastic bag that dissolves in the wash water should be used. The soluble plastic bag, however, for routine, non-isolation use can be effective only if the administrative problem of presorting at the bedside is effectively solved. If additional labor must be provided to do wet sorting, the advantages in environmental control are usually financially out of reach. An alternative method has been used in Europe [1] where canvas bags are sewn on one side with an alginate thread which will dissolve in the hot alkaline solution of the wash process, allowing the bags to open and the linen to be effectively washed. Whatever type of bag is used, ideally it should be trucked to the laundry rather than dropped in a laundry chute. Washable trucks with removable canvas covers should be used to transport bagged linen to the receiving room. (See figure 20.)

The person handling the trucks should be instructed to cover the bagged soiled linen while the truck is being moved through the hospital. Although still the most widely used method of transporting linen, dropping bags into a chute develops a piston effect which forces contaminated air out of the chute into the air moving through the building. In addition, dropping the bag into a chute carries the risk of having it rupture and contaminate other linen, as well as the chute surfaces. A recent study indicates that exhaust ventilation in the laundry chute can reduce both the piston effect and the resulting contamination levels when used in conjunction with

Figure 20. **Inclined conveyor carrying bagged soiled linen from nursing units to truck-loading area. Centralized laundry in this institution is reached by tunnel.**

plastic bags in getting the laundry to the receiving room. The following points are included in the summary of research results:

1. The application of exhaust ventilation to a linen chute can . . prevent the movement of airborne bacteria from inside the linen chute to the hospital corridor during the periods when bags of linen are not actually moving down the linen chute.

2. The application of exhaust ventilation to a linen chute can reduce by about 60 percent the concentration of airborne bacteria in the room at the bottom of the linen chute, resulting from linen dropping to the bottom of the chute and being removed from the chute.

3. The use of plastic bags for the dirty linen results in a 73 percent reduction in airborne bacteria in the room at the bottom of the linen chute.[2]

Another disadvantage of a linen chute is the fire hazard enhanced by its chimney effect. Experience has shown that this can be minimized by installing exhaust ventilation for the chute and by modifying the usual top-mounted sprinkler system with automatic sprinkler heads mounted in recesses built into the chute at each floor level. The recess keeps the linen from catching on the sprinkler head, and installation at each floor level gives fire control coverage to the entire height of the chute.

Odor can be controlled by flushing regularly with an efficient cleaning solution and rinsing by means of a manual spray head. The inside of the chute should be sprayed until it is completely wet. Then the hopper doors and hoppers at each floor should be flushed with the cleaning solution, starting at the top of the building. The solution can be applied to the wall of the chute with a long-handled brush. Liberally applied, the solution will disperse through the spray previously applied to the interior shell, thus reaching inaccessible areas of the chute's interior. The chute should be rinsed with clear water. The scheduling of such cleaning should be regulated as necessary to keep the area free from odor.

Chutes should discharge directly into the receiving room in a stacked building. Wheeled bins should be provided in the receiving room for the various types of pieces which will be washed together after sorting. The bins should be sized to hold the exact load of each pocket of washers. If the receiving room is above the wash room, the sorted linen can be chuted directly to the washers. Otherwise, the bins must be wheeled to the washer for loading.

WASH-ROOM PRACTICE

There are many ways to accomplish removal of soil embedded in linens, but the object is to employ the best method of cleaning without subjecting the material to unnecessary damage from excessive exposure to strong chemicals and mechanical abrasion. These factors are important if the replacement cost of linen is to be kept to a minimum. The laundry can take more life out of linen than normal usage, unless good wash-room procedures are rigidly executed. One good summary of reasons for sorting and washing by categories is found in one of the more valuable handbooks:

1. There are several degrees of soil to be dealt with in the processing of hospital linens, such as light soil which includes the bulk of sheets, pillowcases and so forth and heavy soil, that is, bloody and stained wash. If all the linens are processed, indiscriminately, light soiled items are over-washed in order that the heavily soiled pieces in the load can be thoroughly cleaned. This, of course, means a loss in tensile strength for the former class of linens, since they are subjected to mechanical agitation for a longer period of time than is necessary. Another good reason for classification of

linens is that it is disgusting even to think of table linens being included in the same load with surgical linens

2. The fibers of different materials react, each in its own peculiar way, to temperature, water, alkali and bleach which are all factors in the washing cycle. Cotton, linen, wool, silk, rayon, nylon, and dacron are fibers that are ordinarily processed in the hospital laundry.

3. The classification of linens expedites the laundering process because it eliminates many drying and finishing problems. If it is ever necessary to put two different classes of linens in the washwheel at the same time, it has been found to be more economical with time and labor, if both classifications require the same type of extracting and finishing. For instance, bed pads and bath towels would make a good combination. Under ordinary circumstances, there is enough of one type of item to fill one pocket in the washer.[3]

Rapid advances in chemistry are developing detergents, soups, bleaches, sours, and oils that make possible the excellent quality that should be expected from the modern laundry. But these products must be used according to the formulas developed by the manufacturer, and any deviation from the recommended concentrations must be avoided to prevent diminished tensile strength. The washman may be tempted to increase the concentration to save time, and will thereby defeat the purpose of the entire operation by destroying the fabric. Careful instruction and explanation, together with diligent supervision, is required to prevent such problems.

The water in which these products do their work is a very important consideration for the staff of the engineering department. The delivery of ample quantities of water at sufficient pressure to fill the washers in a minimum of time is but one aspect that concerns the engineer. The pH, or hardness, of the water must be adjusted by adequate treatment and the hot supply delivered at a temperature of no less than 180° F. during the full period of laundry operation. (See Volume V, Chapter III.)

The pH of the water is so important to an efficient operation that a constant check should be made to insure that machine and labor time are not wasted on loads subjected to improper wash solutions. Each washer should be equipped with a thermometer and a pH meter so that the safe limits of bleach, sour, or temperature are not exceeded during the various washing cycles.

Since the multiple suds method of washing hospital laundry has proven so effective, the reticence of some managers to institute this procedure is surprising. Differences of opinion can always be condoned when the results in quality and cost are the same, but a trial of the multiple suds procedure using proper controls will show that less time is needed to maintain a high grade of work with the least wear on the linen.

The correct water levels should be determined for each part of the wash cycle so that chemical concentrations will be correct and the linens will receive the necessary amount of agitation. Supplies constitute only a small part of the total laundry cost, and the additional water and slight increase in supplies used are far outweighed by the savings in machine and labor time. The installation and proper use of automatic valves can play a big part in maintaining efficiency. Their use relieves the washman from being constantly attentive to washer filling, and the predetermined amount of water for the washing process added to the measured cleaning compounds insures the correct solution.

The use of test pieces to determine the efficacy of the wash formulas and timing is very important to the laundry manager. By means of the test information, time and supply levels can be adjusted to improve finished work quality. The loss of tensile strength resulting from faults in the washing process can be controlled and the desired linen finish maintained.

Ample extractor capacity facilitates linen flow by minimizing the time required for tumbling, ironing, or pressing. When the time in the extractor has to be shortened because of limited capacity, the excess moisture left in the linen must be removed in the next process. The extra three or four minutes in extracting a load will save more steam and power than will be needed to remove the moisture from individual pieces on the ironer or in the tumbler. Combination washer-extractor machines save two handlings of the heavy wet linen, whether handling is done manually or by machine, and speed up the flow of linen through the wash room. (See figure 21.)

There are several handbooks [4, 5] available on the various techniques used in laundries. These books represent the accumulation of many years of collective experience which can guide the hospital toward getting the most efficient process for any individual plant.

No process or plan should be adopted as absolute,

but should be kept alive by modifications that use new and better ideas to give the best production attainable as laundry technology progresses.

Laxity in control of linen issued to the nursing areas results in lost linen, a particularly costly and aggravating form of pilferage. Accurate records of the amounts issued to and returned from each area should be tallied against the inventory in the area linen closet to reveal any serious discrepancies. Losses can and should be eliminated. By filing requisitions for the linen issued to each department and counting the returning soiled linen, trouble spots are revealed.

Improper or broken laundry technique can let contaminated linen spread infection in the hospital. Periodic checking of test pieces by the hospital laboratory will reveal shortcomings in the laundering process so that such problems can be rectified before they reach major proportions.

Diapers from the newborn nursery are a particularly hazardous item and should be bagged, handled, and processed with great care. This can be such a critical problem that the use of disposables is highly recommended. Other contaminated linen such as isolation linen or that used for incontinent patients can be soaked in a solution prescribed by the bacteriologist and after the proper exposure time removed with tongs and placed in the washer. The proper washing procedure, with water temperatures and pH levels as indicated above, should produce linen that will pass laboratory tests for bacteriological acceptability.

PERSONNEL RECRUITMENT AND PLACEMENT

Because of the physical rigors of laundry work and the heat to which they are exposed, workers should be carefully screened for physical fitness before hiring. Court awards in compensation cases where workers have expired or been injured on the job have resulted in bad experience ratings and increased insurance costs. Injured workers certainly should not be deprived of protection and compensation, but the hospital should see to it that physically deficient applicants are not hired. A rigid preemployment examination protects not only the interests of the hospital but also those of the worker and his family.

Laundry work requires long periods of repetitive motions, and the arbitrary assignment of a worker to only one particular task tends to stifle his productive capacity. Better results are achieved if workers are periodically rotated to other tasks requiring a different body stance or motion and given rest periods. Rotation may also reveal to the observant supervisor a worker who can do a better job at a different station in the production line than the one to which he is initially assigned.

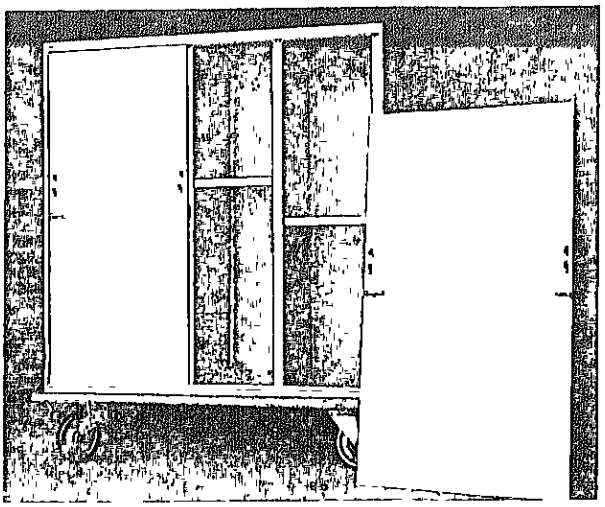

Figure 21. **Laundry cart for distribution and storage of clean linen on wards. Adjustable shelves lend adaptability for varying quantities of each item, while panel door closure preserves cleanliness of linen until used.**

During the indoctrination period, the supervisor has an opportunity to study the new worker's responsiveness, interest, and ability. This forms a foundation for a reasonably accurate estimate of how well the worker will fit into the hospital organization. Performance during the probationary period is the acid test of the judgment of the supervisor, whose ability to teach, lead, and inspire has been in some measure placed on probation along with the worker.

Training, Evaluation, and Safety

Under pressure of getting laundry work out on time, a supervisor will often take the word of an applicant as to his or her ability and experience in performing a given task involving a particular piece of machinery. If the applicant is merely trying to get a job where the machine is going to do the work *for* him instead of *with* him, the entire laundry operation may be jeopardized. All the elements for a serious accident are present, waiting for time to run out. Whenever a new employee is assigned

to a machine, he should be given a thorough orientation on any hazards involved and an explanation as to the "why" of following the instructions. Any attempt at shortcuts in procedure first should be discussed with the supervisor, who is better able to evaluate any advantages or disadvantages involved. When seeking a shortcut on his own initiative, a worker usually violates safe procedures.

Permitting untrained people to start working at tasks with which they are not familiar is a principal factor, if not the main cause, of most employee accidents. The worker may learn his job safely even if left on his own resources, but the liability for injuries should make management take a hard look at available means to eliminate this risk to the experience rating on which compensation insurance is based.

The scalpel lost in a surgical drape, a razor blade left in a discarded towel, or a broken glass connecting tube tangled in a sheet are all potential hazards to the laundry worker. Such hazards can be reduced only by close cooperation of each department in the hospital. Carelessness can create a condition that may do bodily harm to another person who is unaware of the hidden danger, but such negligence can be controlled with the necessary effort.

Laundry department accident-prevention considerations involve chemicals; equipment and machinery, including their safety devices; housekeeping; ventilation systems; and hazards associated with task procedures.

Handling and storage of bleaches, acids, and alkali solutions should be in accord with standard safety precautions. Safety devices such as interlocks on press valves, the safety on the feeder roll of the flatiron, safety valves on hot water and steam supplies, sprinkler system in the laundry chute, check valves on mangles, and all electrical facilities should be routinely checked to assure their proper and safe working order. Water temperature should be limited to 180° F., steam kept within a safe working pressure, and steam lines insulated to prevent burns. Safety maintenance of equipment such as hot water heaters, removal of grease from machinery and equipment, removal of lint from dryers, and clean, dry floors should be facets of good housekeeping and maintenance. Safe task procedures should include use of protective clothing and proper handling of conspicuously marked contagious linen.

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